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Presentation 4 – Image Fusion without Changes in Spectral Characteristics: FFT Based Filtering and IHS Transform

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Abstract

Data fusion exists in different forms in different scientific communities. The term is used by the image community to address the problem of sensor fusion, where images from different sensors are combined. The term is also used by the database community for parts of the interoperability problem. The logic community uses the term for knowledge fusion. In this paper, we focus on the development of fusion techniques for remotely sensed data (image fusion). Usually, they can be classified into three levels: pixel level (ikonic), feature level (symbolic) and knowledge or decision level. Of highest relevance for remote sensing data are techniques for ikonic image fusion for which many different methods have been developed. However, existing techniques hardly satisfy conditions for successful fusion of the new generation high-resolution satellite images such as IKONOS, Landsat-7, SPOT-5 and QuickBird or ultra high resolution airborne data. All of the new generation satellite and aircraft sensors provide high-resolution information only in their panchromatic mode whereas the multispectral images are of lower spatial resolution. The ratios between high resolution panchromatic and low resolution multispectral images vary between 1:2 and 1:8 (or even higher if different sensors are involved).

For high resolution multispectral datasets, the panchromatic information has to be merged with the multispectral images. Image transforms such as the Intensity-Hue-Saturation (IHS) or Principal Component (PC) transform are widely used to fuse panchromatic images of high spatial resolution with multispectral images of lower resolution. These techniques create multispectral images of higher spatial resolution but usually at the cost that these transforms do not preserve the original color or spectral characteristics of the input image data. In this paper, a new method for image fusion will be presented that is based on the standard IHS transform combined with filtering in the Fourier domain. This method preserves the spectral characteristics of the lower resolution multispectral images.

An ideal fusion function would add the high resolution spatial components of the panchromatic image (i.e. edges, object changes) but disregard its actual gray values. For a thorough analysis of the information distribution along the spatial frequencies of an image we make use of Fourier transform (FT) theory. An FT transforms the image into the frequency domain or, to be more precise, into the intensity and phase spectrum. The intensity spectrum provides the information about the distribution of image content along the spatial frequency axes, thus allowing the design of image adapted filters. These filters will be employed before the fusion process takes place. Examples for FFT based filtered image fusion are presented for SPOT and Ikonos panchromatic images fused with Landsat TM and Ikonos multispectral data. Comparison with existing fusion techniques such as standard IHS, PC or Brovey transform prove the superiority of the new method. While in principle based on the IHS transform (which usually only works for three bands), the method was extended to any arbitrary number of spectral bands. Using this approach, this method can also be applied to sharpen hyperspectral images without changing their spectral behavior.

Keywords: image fusion, pan sharpening, spectral characteristics preserving fusion, FFT filtering

Image Fusion without Changes in Spectral Characteristics: FFT Based Filtering and IHS Transform

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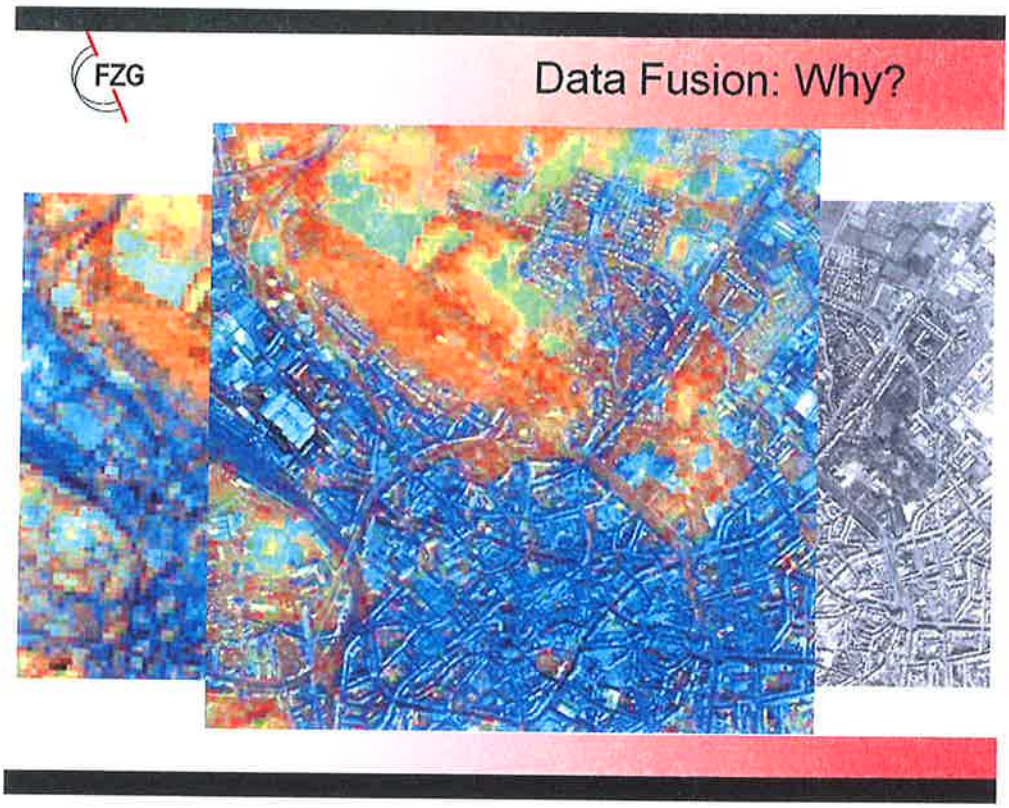
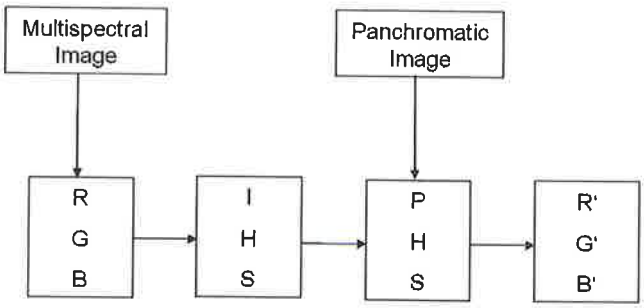
Image Fusion without Changes in Spectral Characteristics: FFT Based Filtering and IHS Transform



Example: Image Fusion via Intensity-Hue-Saturation (IHS) Transform



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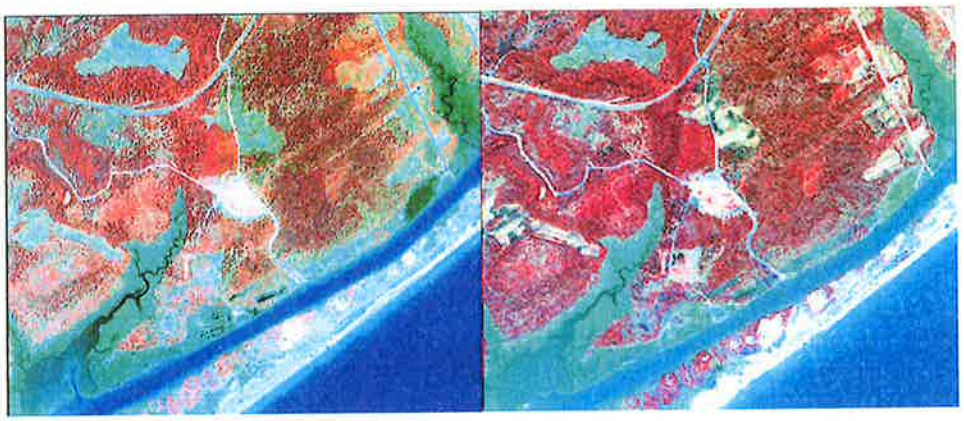
Data Fusion Problem: Color Distortion



Multispectral Ikonos Image (4,3,2) – histogram equalization

PC Merge Ikonos (pan + multispectral) – histogram equalization

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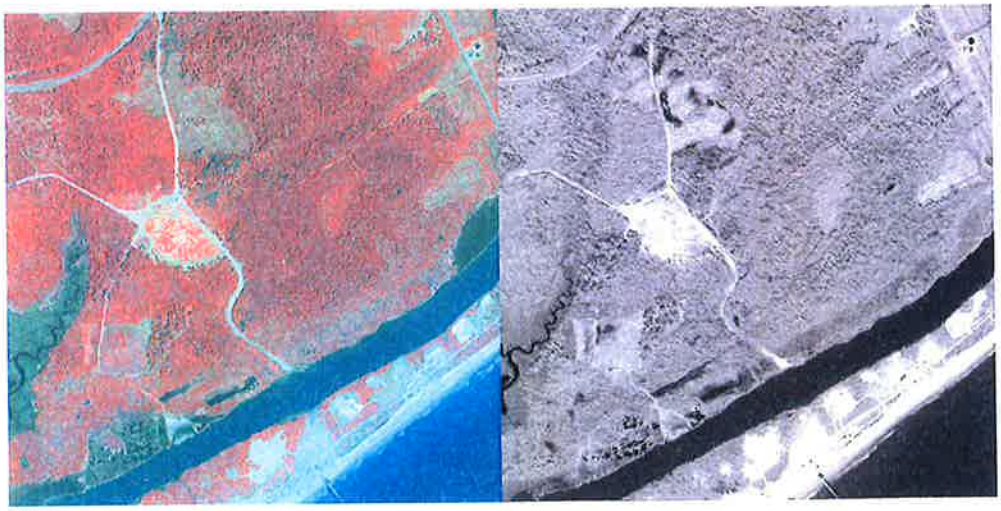
Problem: Fusion of Different Dates



Multispectral Ikonos Image 02/2002

Panchromatic Ikonos Image 08/2001

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IHS Transform

Intensity Component 02/2002

Panchromatic Image 08/2001

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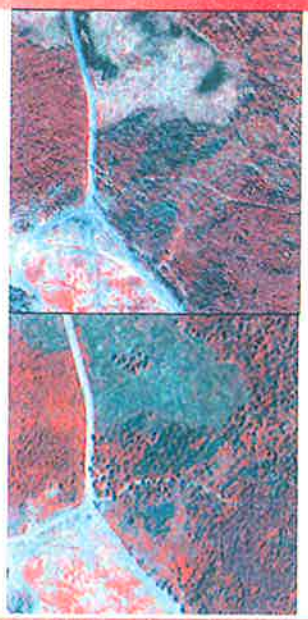
IHS Based Data Fusion



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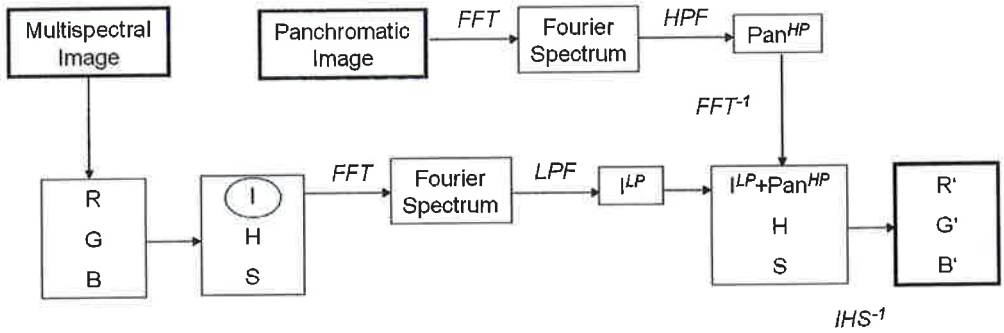
FFT Filter Based Data Fusion

Basis: IHS Transform and Filtering in the Fourier Domain



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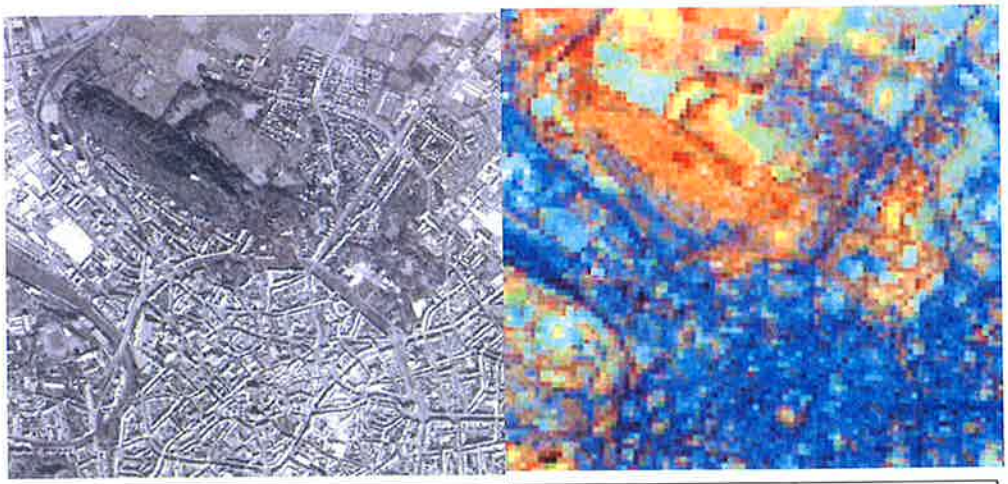
Landsat ETM / SPOT 5 Data Fusion



SPOT 5 5-m Resolution Image Rectified to Gauß-Krüger (03/2003)	Landsat 7 ETM 30-m Resolution Image Registered and Resampled to 5 m (6/2001) (4,5,7)

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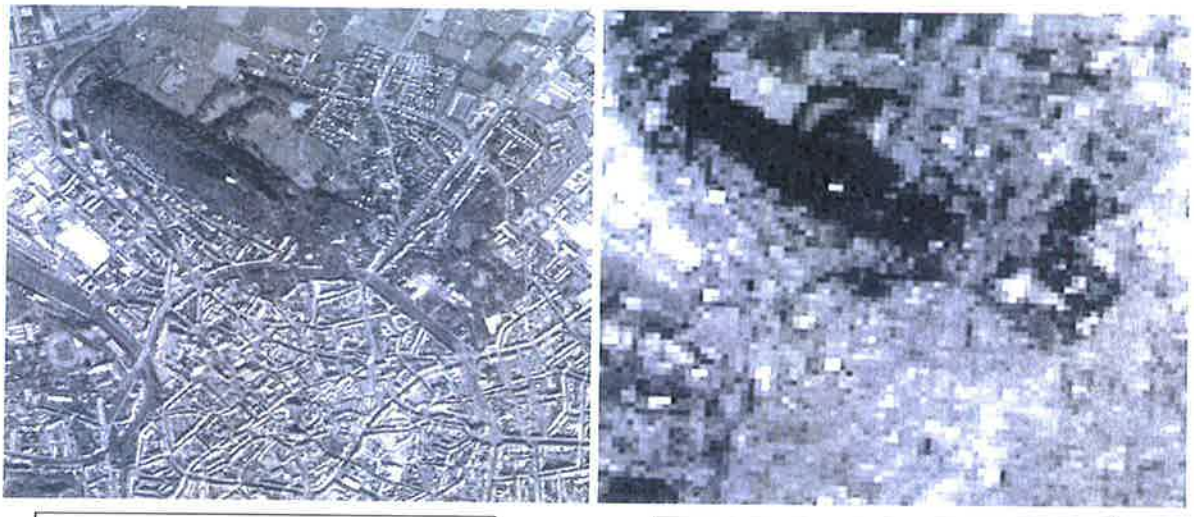
Landsat ETM IHS Transform Bands 4,5,7



SPOT Pan

Landsat ETM Intensity Component

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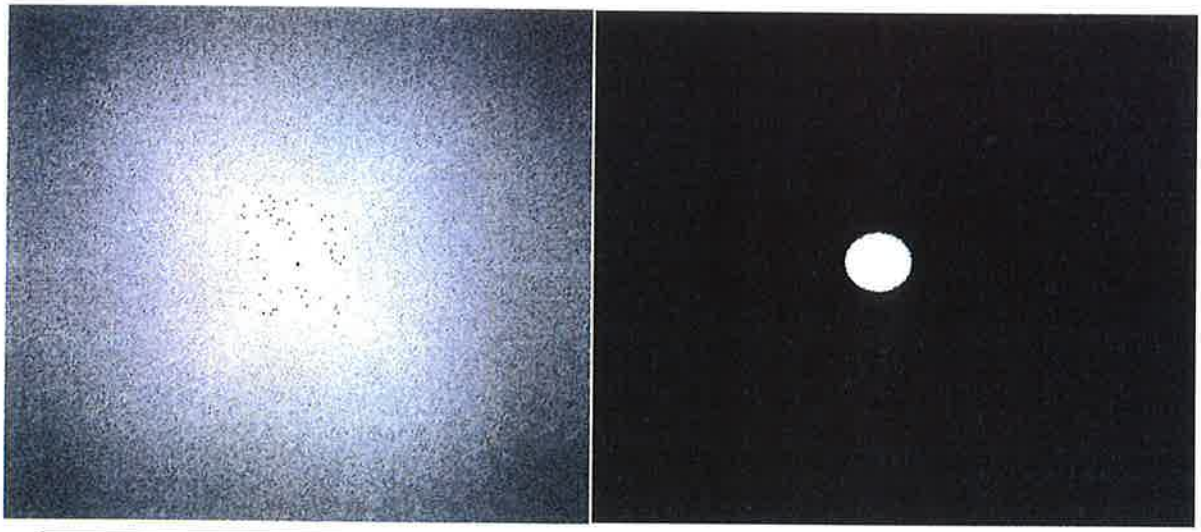
Powerspectra after Filtering



High Pass Filtered SPOT Spectrum

Low Pass Filtered ETM Intensity Spectrum

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Images after Filtering

High Pass Filtered SPOT Image

Low Pass Filtered ETM Intensity Component

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Fused Intensity Component

Intensity^{LP} + Pan^{HP}

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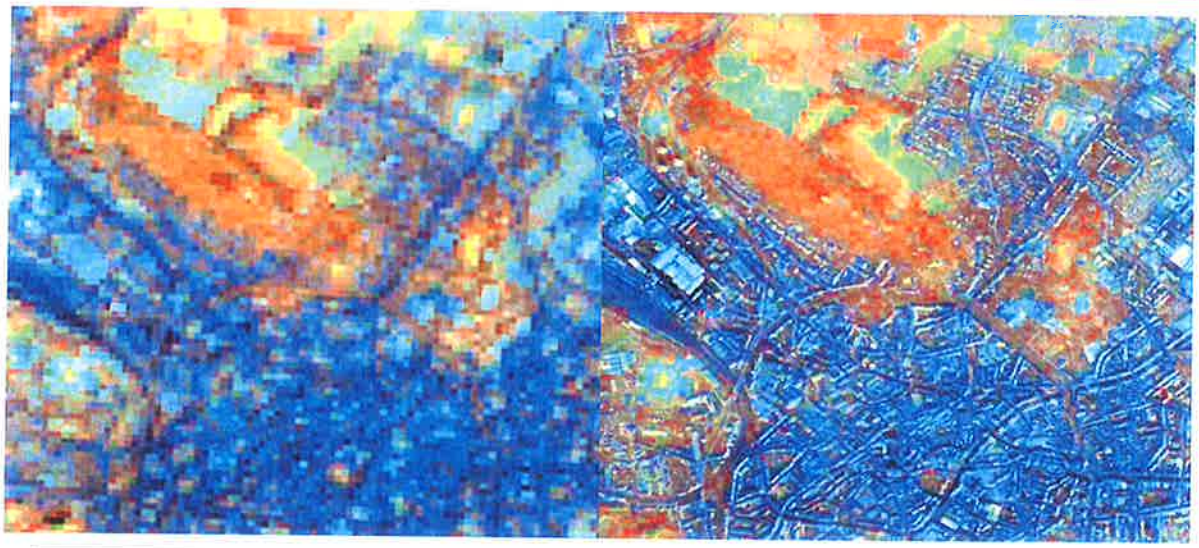
Fused RGB Display



Original ETM Image (R=4, G=5, B=7)

FFT Based Filtering Fusion

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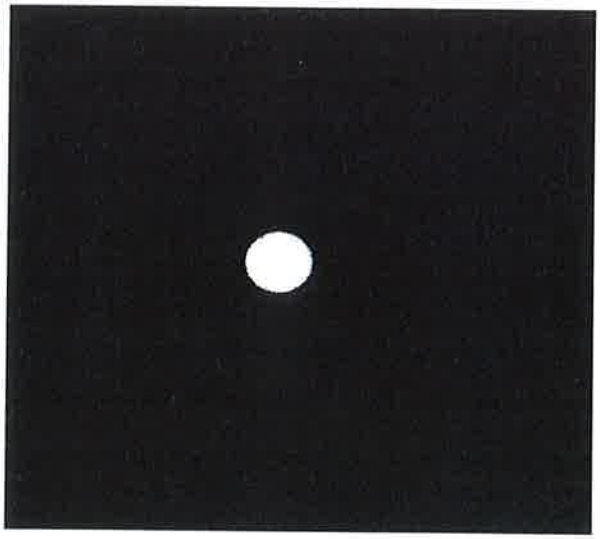
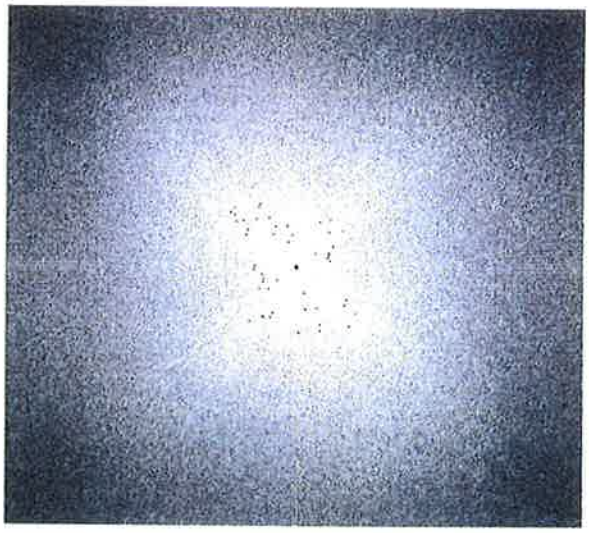
Powerspectrum after FFT Filtering



Low Pass Filtered Intensity Component



High Pass Filtered Panchromatic Image

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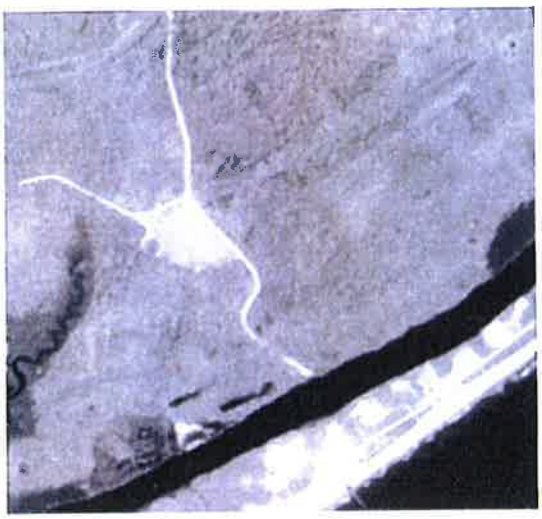
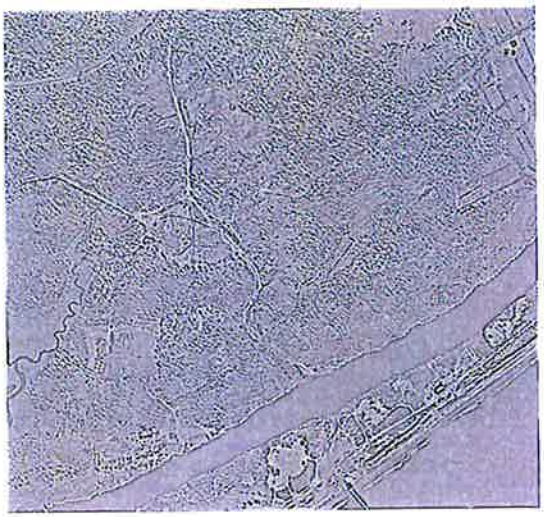
FFT Based Filtering



Low Pass Filtered Intensity Component



High Pass Filtered Panchromatic

9 of 24 - Clipboard
Item collected.

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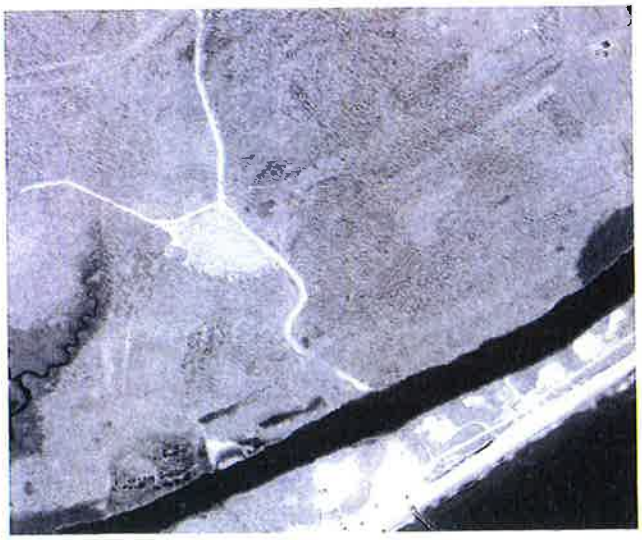
Sharpened Intensity Component



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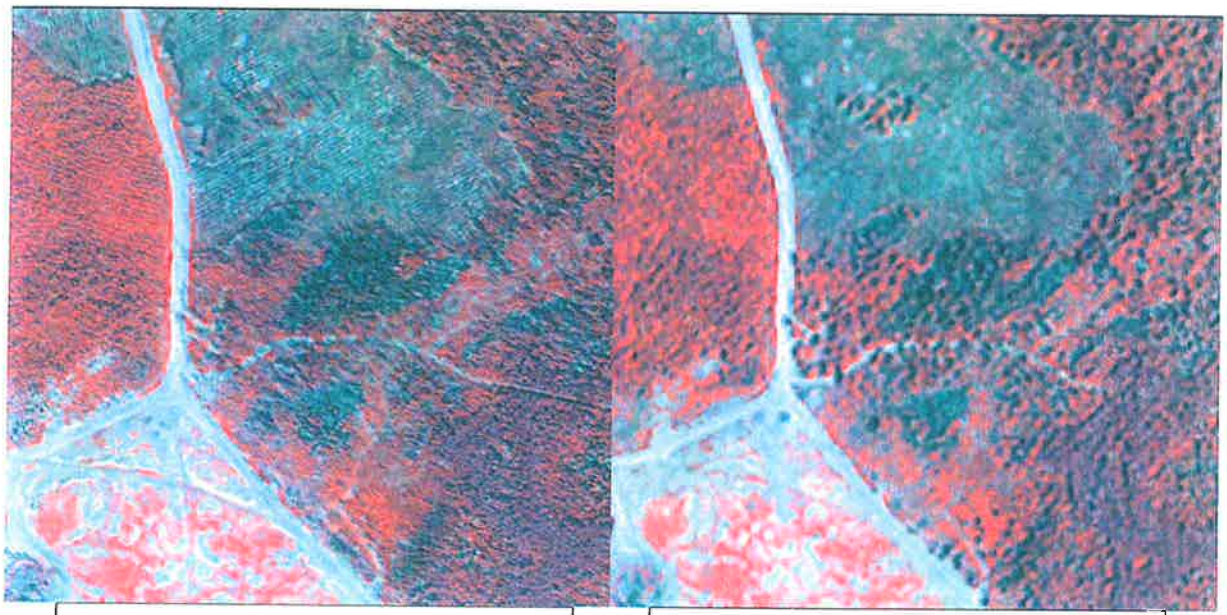
IHS Based Fusion Results: Ikonos



Fused Ikonos (pan + ms) Image (4,3,2)

Original Ikonos ms Image (4,3,2)

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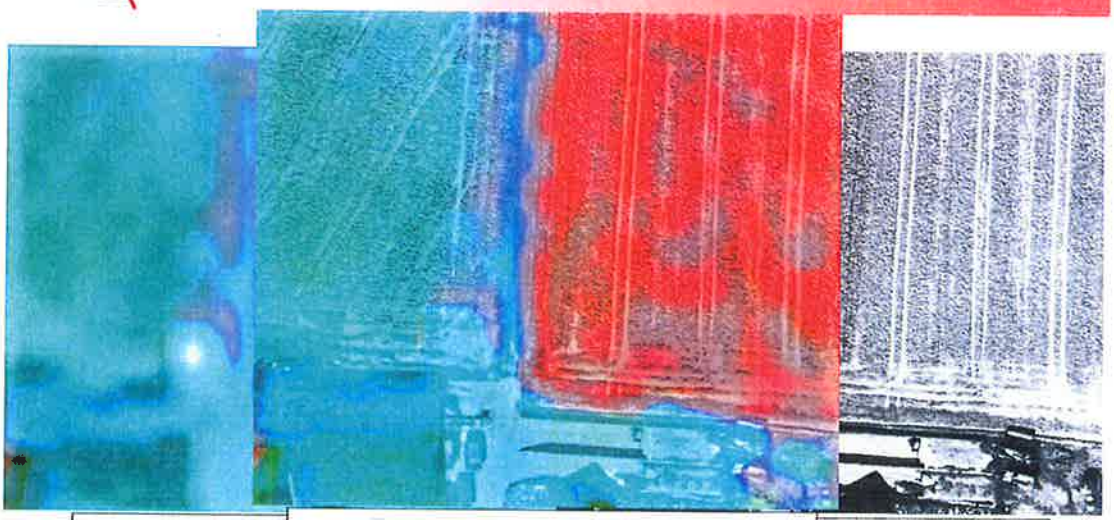
Hyperspectral Image Fusion



Hymap Image Dat
Original Resolution

Fused Hymap/HRSC Image Data
(IHS/FFT Merge)

l Camera Data
olution: 0.16 m

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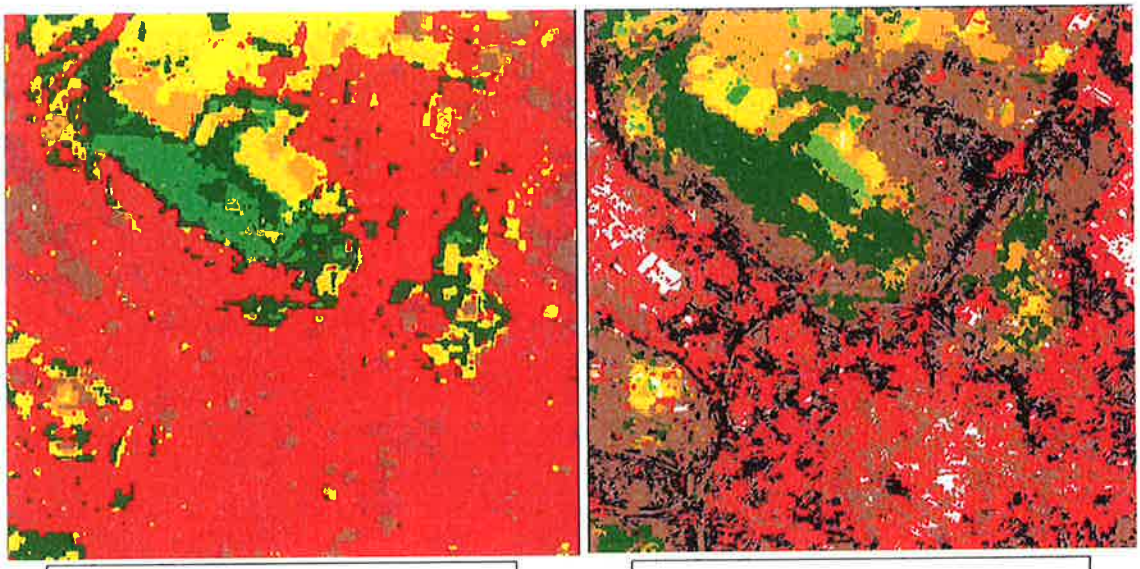
Fused Classification Results



Original ETM Image

Fused ETM/SPOT Image

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CIR Display

Bands 4,3,2
(direct IHS FFT Fusion)

Bands 4,3,2
(Subset IHS FFT Fusion 1,2,3 and 4,5,7)

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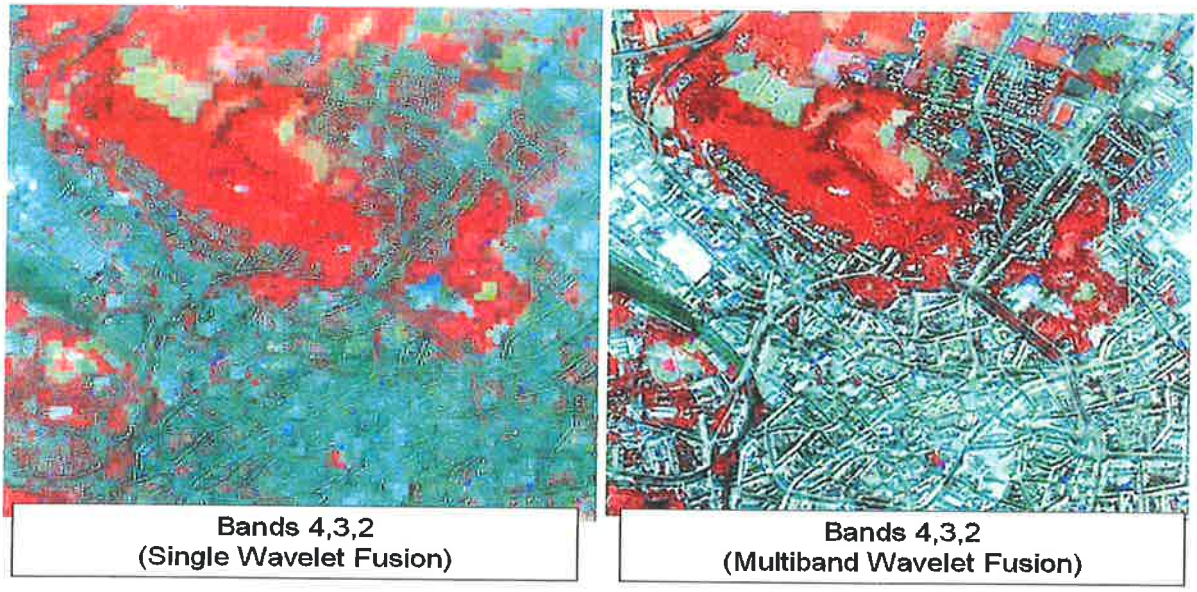
CIR Display



Bands 4,3,2
(Single Wavelet Fusion)

Bands 4,3,2
(Multiband Wavelet Fusion)

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Conclusion

- FFT Based Filter Design Coupled With IHS Data Fusion Creates Enhanced Images Without Spectral Change
- It Works also if the Panchromatic Information Does not Match the Spectral Sensitivity of the Merged Bands
- Its Performance is Superior to Standard Fusion Techniques (IHS, Brovey Transform, PC Merge)

Presentation 5 – Comparison of different methods for supervised digital classification of VHR images

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Abstract

The VHR images due to their spatial resolution, potential geometric quality, and thematic content are considered as a good source of information about land cover and land use, particularly for more spatially complex agricultural areas. These properties make the VHR images potentially valuable and promising products for control with Remote Sensing purposes in the IACS frame. With regard to the nominal and inherent features of the VHR data the choice of methodology applied in their digital processing is especially important.

This presentation includes an assessment of different approaches to digital image analysis of very high resolution images, aimed at identification and delineation of land cover and land use features in agricultural areas. The goal was to evaluate the performance of existing methods, and also to make possible comparisons. The test sites represent a diverse range of terrain characteristics and levels of spatial structure complexity.

The examples of the presented results can be groupped into two main approaches: 1) pixel based image classification, and 2) object oriented multi-scale image analysis, with classification of image objects extracted stepwise in an image segmentation approach. The first approach includes both statistical parametric algorithms and nonparametric neural network algorithms; the second one applies eCognition software-based procedures.

The tests were carried out on standard multispectral sets of VHR images, as well as on pan-sharpened bands of IKONOS and Quickbird images including 16 and 8 bits options of processing. For one site the results of two ADS40 classifications were compared to those of QuickBird classifications as well.
Last, general comments about advantages and limitations of the methods and approaches as well as recommendations will be presented.
Keywords: VHR, IKONOS, QuickBird, ADS40, land cover, classification, segmentation, object, agriculture

Comparison of different methods for supervised digital classification of VHR images

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The presentation is based on the research work done during the author's stay at JRC Ispra, IPSC, Agriculture and Fishery Unit.
**) the MLC test related to ADS 40 was done by Monika Chojowska*

Outline of this presentation

- Thematic content extraction from VHR images for agricultural areas, pixel based versus object based approach.
- The essence of object oriented analysis. The perception of earth / land surface in the image analysis.
- Review of the selected classification results achieved by applying both approaches (i.e. pixel and object based).
- Conclusions.

Thematic information extraction from VHR images – general considerations (1).

- The usefulness of traditional satellite images (e.g. SPOT XS or Landsat TM) for land cover, land use, or crop classification in agricultural areas with complex spatial structures, presents a certain level of limitations.
- Geometric quality evaluation tests confirmed high geometric accuracy of orthorectified VHR based on products.
- Small and narrow fields need to be analyzed with an adequate spatial resolution images.
- higher spatial resolution – while reducing the problem of mixed pixels - exacerbates the internal variability of the classes and statistical noise, which can be significant and perturb classification accuracy.

Thematic information extraction from VHR images – general considerations (2).

- How accurate (thematically) and valuable can be output from VHR image analysis; one date image? or time series (costs...)?
- the VHR image acquisition date versus the optimal date for thematic information extraction?
- Which approach and methods can be applied in wide operational mode (*not too complex & easy repeatable*)?
- Digital image processing for original 16 bits image data format or 8 bits?

Thematic accuracy of digital classification.

The accuracy depends on many different factors.
For the given type of image (and its GSD) it can be sensitive in particular to:

- number of classes and their definitions
- classification method (*incl.* algorithm)
- date of image acquisition, quality of image
- quality of data for verification

Problematic issues for traditional pixel based classifiers

For medium, high resolution satellite images:

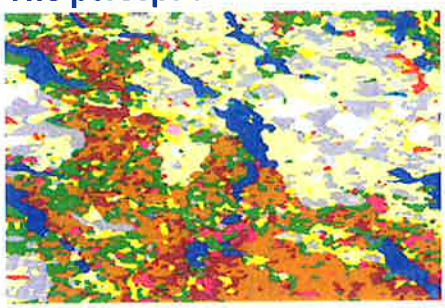
- **classification of mixed pixels**
- **boundary delimitation ambiguity**

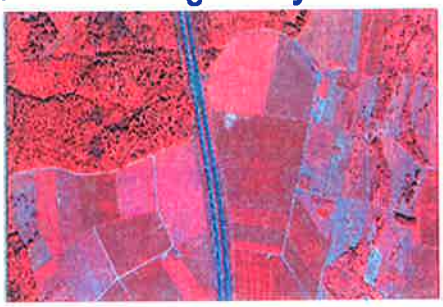
For very high resolution satellite images:

- **high internal variability of the classes**
- **significant increase of statistical noise**

! Other features (attributes) like e.g. shape, size, texture, pattern, context, which can be as discriminators of visually perceptible objects on the image are not explored.

The perception of earth / land surface in image analysis





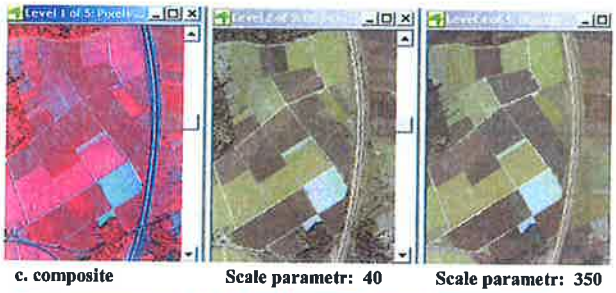
- Distinguishable 'objects' are often as perception units in visual interpretation; the significant rule of their spatial context, relationships.
- The importance of spatial SCALE (presumed by image GSD).
- *Extraction of real world objects and their features - expected result of many image analysis tasks. (RS => GIS needs).*
- *Object – group of similar, adjacent pixels; area with relatively homogenous land cover (or other homogenous characteristics).*

Scale dependencies in image analysis

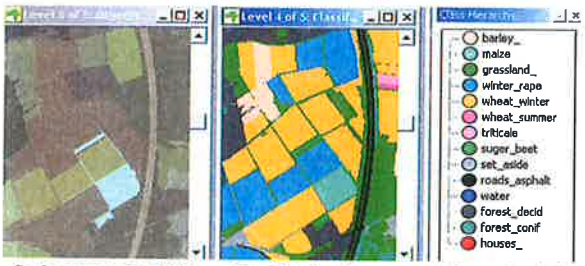
- The given objects of interest often have their own inherent scale.
- Occurrence or nonoccurrence of a certain object class is scale dependent.
- The same type of objects appears differently at different scales.
- the classification task and the respective objects of interest directly determine a particular scale of interest.
- Scale is a crucial aspect of image understanding and its analysis.

Example: visual interpretation of different GSD images series (e.g. Landsat MSS, Spot XS, Ikonos MS) for the same area.

Object oriented image analysis approach



c. composite | Scale parametr: 40 | Scale parametr: 350



Scale parametr: 1000 | Classification for segmentation on level 4

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Segmentation (1)

Segmentation is the subdivision of an image into separated regions. Different approaches exist, for example:

- **region growing algorithms cluster pixels starting from a limited number of single seed points,**
- **texture segmentation algorithms,**
- **knowledge-based approaches. The knowledge derived from training areas or other sources is incorporated into segmentation process.**

„Comparison of different methods for supervised digital classification of VHR images", J. Chmiel

Segmentation (2) in eCognition

- multiresolution segmentation is a bottom up region-merging technique starting with one-pixel objects.
- in numerous subsequent steps, smaller image objects are merged into bigger ones.
- throughout this pairwise clustering process, the underlying optimization procedure minimizes the weighted heterogeneity *nh* of resulting image objects, where *n* is the size of a segment and *h* an arbitrary definition of heterogeneity.
- in each step, that pair of adjacent image objects is merged which stands for the smallest growth of the defined heterogeneity. If the smallest growth exceeds the threshold defined by the scale parameter, the process stops.
- multiresolution segmentation is a local optimisation procedure.

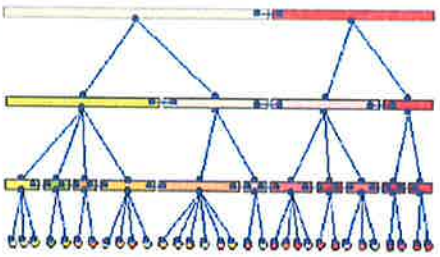
eCognition segmentation (3) , *heterogenity criterion*

Heterogeneity in eCognition considers as primary object features color and shape. The increase of heterogeneity f has to be less than a certain threshold.

$$f = w_{color} \cdot \Delta h_{color} + w_{shape} \cdot \Delta h_{shape}, w_{color} \in [0, 1.], w_{shape} \in [0, 1.] w_{color} + w_{shape} = 1$$

The scale parameter is the stop criterion for optimization process. Prior to the fusion of two adjacent objects, the resulting increase of heterogeneity *f* is calculated. If this resulting increase exceeds a threshold *t* determined by the scale parameter, then no further fusion takes place and the segmentation stops.

Hierarchical network creation in eCognition



Four-level hierarchical network of image objects in abstract illustration (Benz et al., 2004).

- Object borders must follow borders of objects on the next lower level
- Segmentation is constrained by the border of the object on the next upper level.
- Structures of different scales can be represented simultaneously and thus classified in relation to each other.
- Different hierarchical levels can be segmented based on different data
- Object shape correction based on regrouping of sub-objects is possible

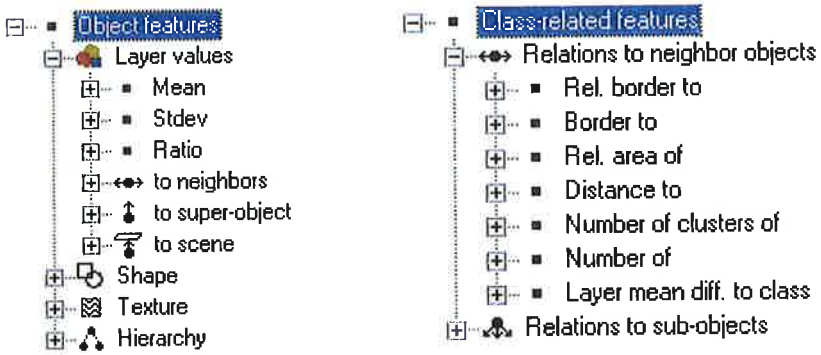
Classification (1) with eCognition

The eCognition performs sample-based and knowledge-based supervised classification, or a combination of both.

Sample-based (nearest neighbour) classification uses a set of training areas (representatives of defined classes) which allow to identify a common feature of selected objects forming a given class and thereby to extrapolate the identification process for the rest of image extension.

Knowledge-based classification enables the user to formulate concepts and knowledge about the relevant image content and, in this way, to come up with a knowledge base which can also be used to process contextual information. The knowledge base itself is created by means of inheritance mechanisms, concepts and methods of fuzzy logic, and semantic modeling. []

Nearest neighbour classification *feature space*



Classification (2) with eCognition

Successful information extraction is usually a kind of iterative process with certain sequence of segmentation and classification runs, which typically can include:

- **initial segmentation, which is based on low-level information, e.g. the pixel values and basic features of the intermediate image objects. The initial (multi-scale) segmentation provides image object primitives with a certain spectral behavior, shape and context,**
- **preliminary classification on previously obtained object features,**
- **classification-based segmentation done for classification result (classification is treated as high-level input for segmentation),**

Methodology assumptions for the tests.

- For all sites similar methodological scheme was applied.
- The supervised approach was used for all variants of classification, assuming the same set of training areas in all trials per site.
- preference for effective but less scene dependent and complex variant of procedures.
- The tests were carried out for standard multispectral sets of images, as well as for pan-sharpened bands (multispectral channels merged with panchromatic information of a higher spatial resolution).

Classification test for *'Glau'*

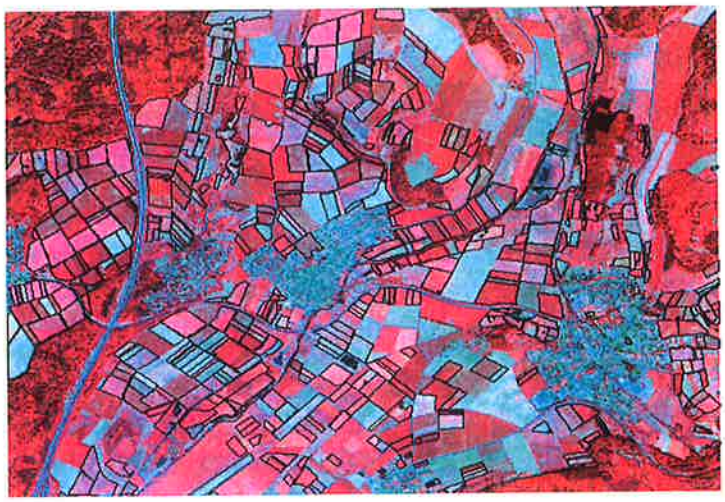
The test site with the area about 20 km2 is a part of 'Glau' VHR-site which is situated in the middle of Germany, in Mittelhessen.

There are smaller farms, mainly with typical cereals and grassland

The QB image has been acquired on 08-06-03 with off nadir view angle = 12.16° and GSD = 0.65m for panchromatic and GSD = 2.6m for multispectral image. The ortho ready standard product level was delivered, which was next orthorectified.

As an ancillary data the shape file with agricultural parcels declared in 2003 season was used what was useful for preparing the training and test ares.

'Glau' test site



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'GLAU' - thematic classess

Class id	CROPCODE	GROUP Code	CROP NAME
1	132	100	Summer Barley
2	131	100	Winter Barley
3	171	100	Grain Maize
4	451	400	grasslands (wet, harvested twice a year)
5	453	400	grasslands (for cattle)
	454	400	grasslands (for cattle, sheep, not intensive used)
6	452	400	grasslands (harvested more times a year)
7	311	300	winter rape seed
8	115	100	Winter wheat
9	116	100	Summer wheat
10	155	100	Triticale
11	620	600	sugar beet
12	511	500	set-aside without industrial set-aside
13			water
14			forest deciduous
15			forest conifer
100 – cereals, 300 – oilseeds, 400 – forage crops and grassland, 500 – set aside, 600 – root crops			

The list of thematic classess for GLAU site.

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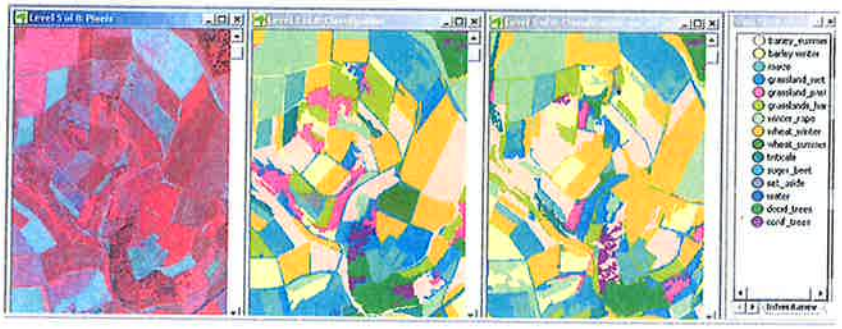
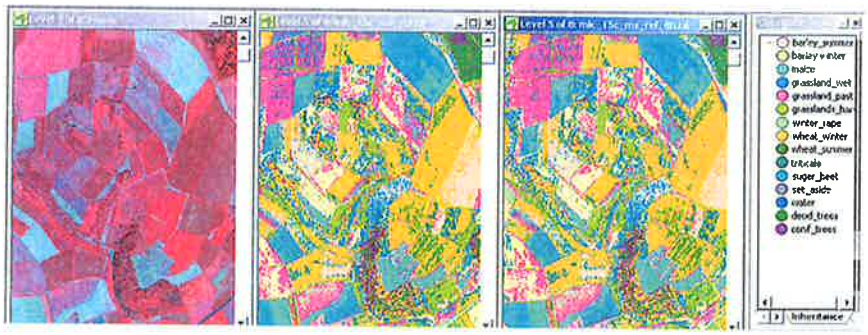
'GLAU' Classification results



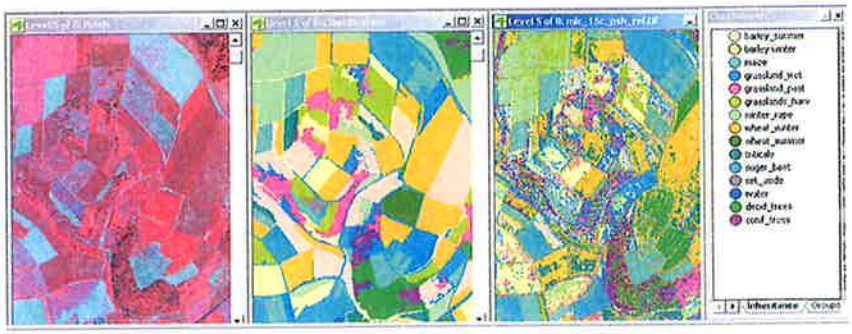
GLAU 1: CC; eCogn_clas scale 300, spectr psh; eCogn_clas sc 70 ms

'GLAU' Classification results



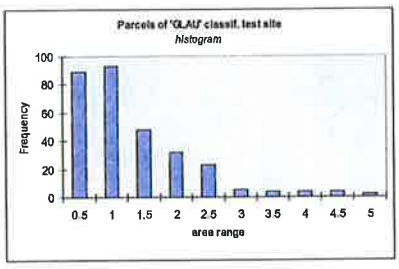
GLAU: CC; mlc 16b; mlc 8b ms

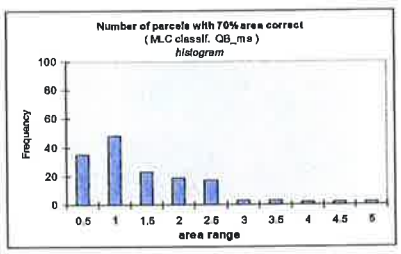
'GLAU' Classification results

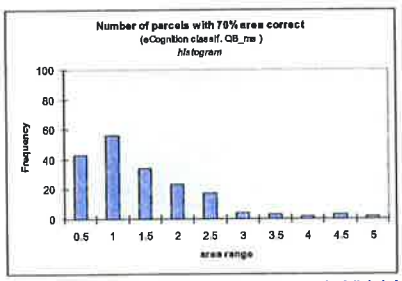


GLAU: CC; eCogn_clas sc 300 spectr psh; MLC psh

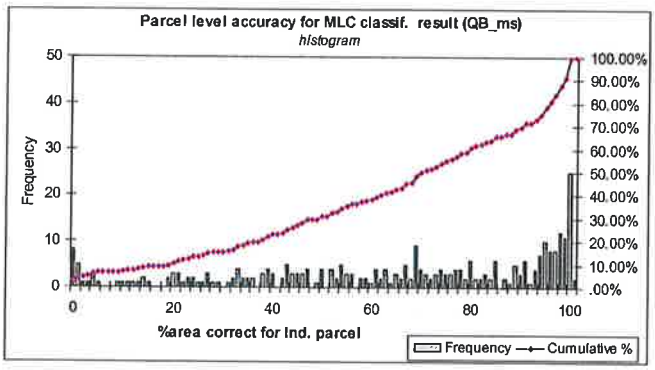
Parcel based check of classification results (1)





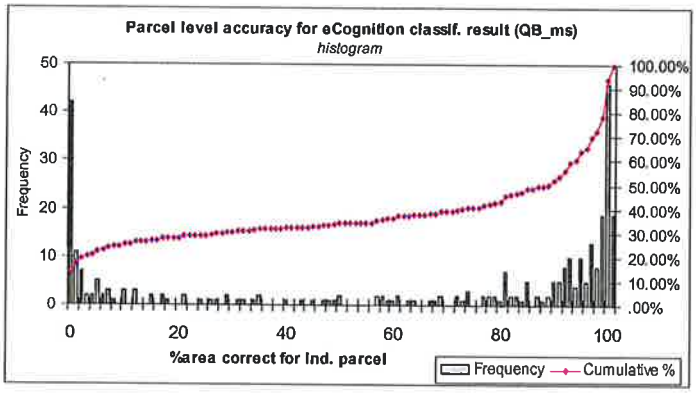


Parcel based check of classification results (2)



MLC: 67.9% (232.0 /341.6) area correct; / 50.1% (154 / 307) parcels correct with thrsh 70%

Parcel based check of classification results (3)



eCognition: 69.5% (237.6 /341.6) area correct; / 61% (187 / 307) parcels with 70% thrsh correct

'GLAU' Classification results - overwiew

Site/method	MLC			eCognition
	ms_16b	psh_16b	psh_8b	ms_16b
GLAU	0.4785	0.5061	0.5080	0.6191

Overall Kappa index values for classification results

'Les Alpilles' QuickBird, ADS40 test site

- It has about 39 km² area and is located in the south of France (part of Les Alpilles VHR site).
- The test site includes partially some hilly terrain conditions. Different agricultural cultivations are present in the above mentioned area, ranging from permanent crops (olive, wine) to more arable fields (mostly cereals, maize and sunflower).
- The QuicBird image has been acquired on 18-06-03 with off nadir view angle = 8.42° and GSD = 0.6m for panchromatic and GSD = 2.4m for multispectral image.

'Les Alpilles' – thematic classess

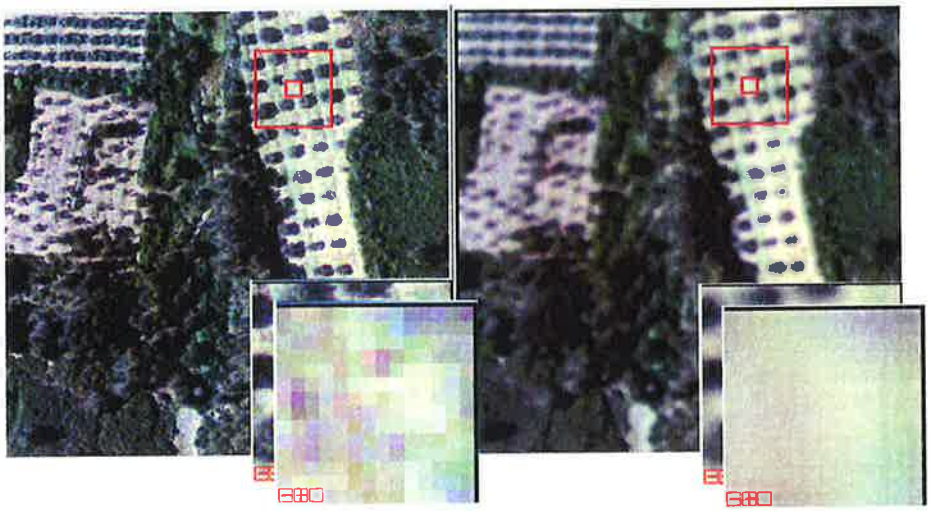
Class id	Class name
1	cereal
2	maize
3	grassland
4	grass_cut
5	swamp
6	canal
7	glasshouse
8	shrubs
9	forest
10	set_aside
11	soil
12	rock
13	olive_trees
14	fruit_trees

ADS40 - improvement of MLC classification by applying Adaptive Filters

- Smoothing image data, without removing edges or sharp features in the images
- The following filters were checked:
  - Frost Filter
  - Lee Filter
  - Gamma Filter
  - Enhanced Frost Filter
  - Enhanced Lee Filter

The best result was obtained for Frost filter

The efect of filtering (ADS40)



ADS40 - comparing no-filtering and filtering image

Standard classification

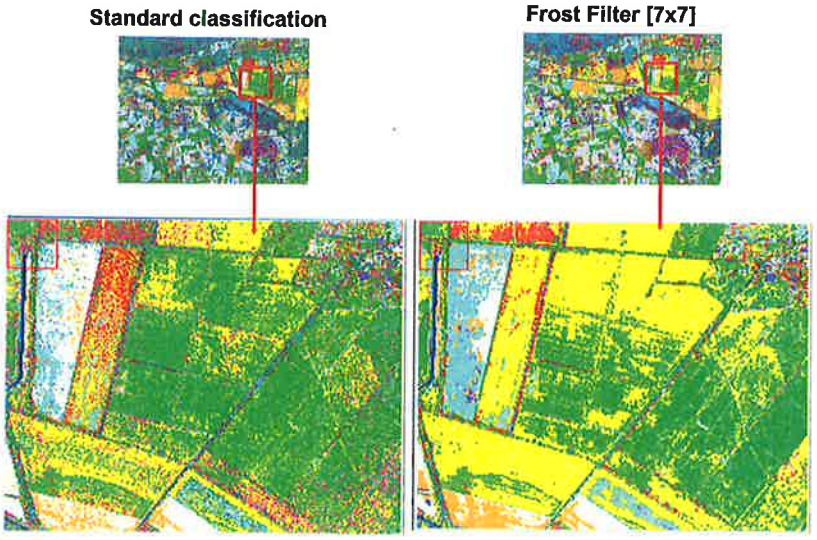
Frost Filter [7x7]

Band	Standard image			Filtered image (Frost Filter [7x7])		
	Minimum	Maximum	Standard deviation	Minimum	Maximum	Standard deviation
1	2870.00	52286.00	4732.71	6175.00	45033.00	2291.08
2	4814.00	52088.00	5825.10	7472.00	44338.00	2280.32
3	3217.00	46082.00	4305.42	10477.00	39365.00	1755.74
4	299.00	2372.00	118.10	406.00	1696.00	34.04

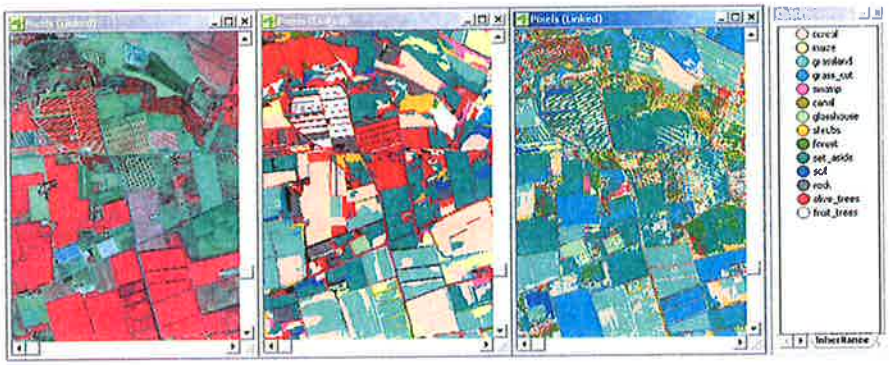
ADS40 - classification results

- **Significantly improvement versus the results of automatic classification**
- **The best results of Frost Filter with filter window [7x7]**
  - **overall accuracy:**
    from 80.9% to 89.0%
  - **kappa index:**
    from 0.79 to 0.88

ADS40 - comparing standard classification with classification by applying Frost Filter [7x7]



Classification results: QB, ADS40



'Les Alpilles' site from left: cc QB;/ QB classification ecogn 150 sc, spectral m,stdev, ratio;/ ADS40 mlc based on Frost filter 7x

Classification results: QB, ADS40

'Les Alpilles' site from left: cc ADS40;/ ADS40 mlc based on Frost filter 7x7; // QB classification ecogn 150 sc, spectral m,stdev, ratio

'Les Alpines' test site - classification results comparison

Site/method		MLC		NN		eCognition	
	QuickBird	psh_16b	psh_8b	ms_16b	psh_16b	ms_16b	psh_16b
Les Alpilles	QuickBird	0.7985	0.8180	0.5381	0.6764	0.5681	0.7234
For ADS40:	MLC: 0.79;	MLC *(Frost f.)*: 0.88;		eCognition: 0.95			

Overall Kappa index values for classification results.

Conclusions (1)

- object oriented approach in image analysis can be to a certain degree an important alternative (to classic methods) for identification of crops and land uses in agricultural areas.
- The efficiency of the approach is significant in more spectrally heterogeneous, textured areas where the segmentation process and extension of feature space to spatial domain makes the classification performance better compared to the results of traditional methods.
- there is visible influence (in accordance with the known rules) of time relationship between the date of image acquisition and crop calendar on final crop identification. For the images acquired in time with low level of differences between crops and higher homogeneity, the rule of spatially oriented discriminative features becomes weaker.

Conclusions (2)

- in case of object oriented analysis, the ambiguity in crop identification can result in classification errors for the whole area of object and not just to the certain percentage of pixels as would usually be in case of a pixel based approach.
- In the above mentioned identification conditions the methodology of object oriented analysis needs to be more individually adapted to certain groups of crops.

Conclusions (3)

- pansharpened image products can be successfully used for classification – the classification accuracy is at least as good as for multispectral (with original resolution) set of images for all tested methods, giving much better spatial quality of identified areas (objects)
- in case of pansharpened image choice, the most important problem concerns the size of files and necessary time of processing – prompting testing on the classification performance of 8-bit converted (instead original 16-bit) images.
- The results showed that thematic accuracy with 8bits images is not worse compared to results achieved for 16 bits images and such classification image still preserving advantages of pansharpened product,

THANK YOU
FOR YOUR ATTENTION

References

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- Definiens Imaging, 2002. eCognition object oriented image analysis. User Guide 3. Definiens Imaging GmbH, Germany.
- Definiens Imaging, 2003. eCognition professional, Brochure. http://www.definiens-imaging.com/down/ecognition.pdf (accessed 19 March 2004).
- Chojowska M., 2004. Use of airborne scanner data (ADS40) for agricultural crop classification. *Internal Final Report, MARS Unit, IPSC, DG JRC Ispra.*

Presentation 5 – Test of classification with VHR data in the Spanish Remote-sensing Control of Arable & Forage Land (2004 campaign)

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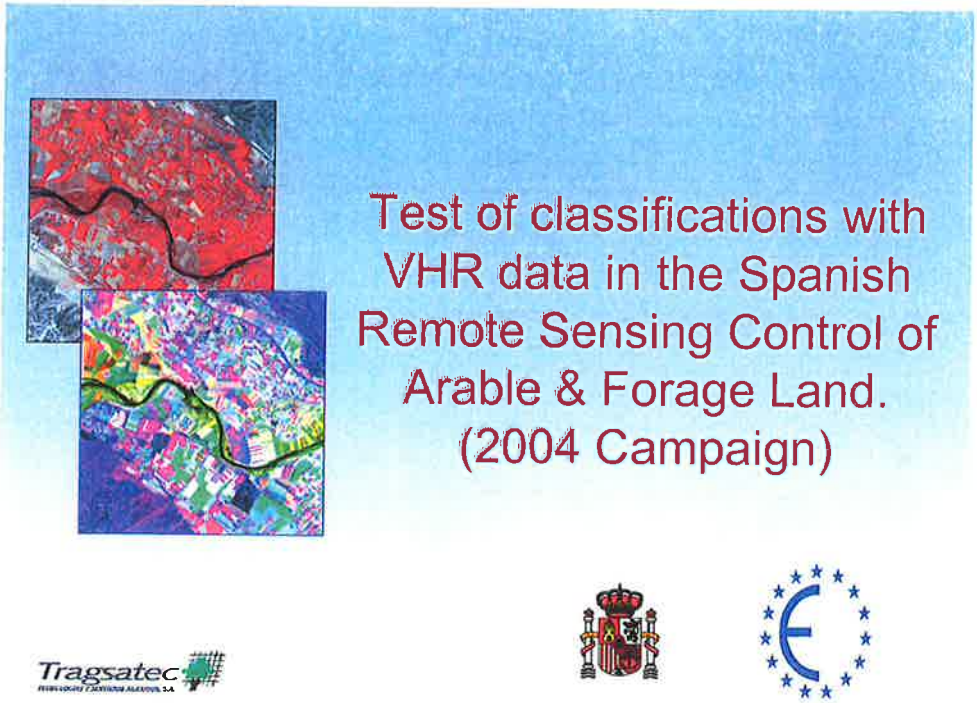
Abstract

In Spain, automatic per-pixel classifications (isodata algorithm) based on multitemporal HR images are usually performed as a support to the interpreter for crop identification. In the 2004 campaign, three Spanish sites have been classified substituting the second spring HR image by VHR data in order to assess the potential of VHR in terms of spatial resolution. The tests carried out consisted in classifying the HR+VHR series of images 1) resampling the Ikonos (and HR) images to 10 meters and Quick Bird (and HR) images to 5 meters pixel size 2) resampling the HR images to the VHR original data resolution. The results of both types of classifications were analyzed using the ground truth sample and the rapid field visit data. No significant difference between both classifications was observed for any particular crop nor even for small parcels (< 0.3 ha).

Although VHR images are a demonstrated valuable tool for improving crop recognition by photo interpretation, the use of a multitemporal- multiresolution per-pixel isodata classification with just one VHR image has not further improved crop recognition.

A second test was performed to assess the importance of the spectral bands on the classification accuracy. For this test carried out over ALMO site (Aragón), a SP4 XI image from May was added to the initial set of imagery to be classified composed by: Spot 2 (March), QB (May-Jun) and Spot5 (July) The comparison between the two classifications showed that the discrimination of rice and maize was higher with the classification that incorporate the SP4 image. This was due to the influence of the SP4 SWIR band which helps discriminating maize from flooded parcels of rice, clearly identified in the SWIR band of the SP4 of May the 15th.
Keywords: VHR satellite images, classification, spatial resolution, spectral resolution, middle infrared band, crop recognition.


Test of classifications with VHR data in the Spanish Remote Sensing Control of Arable & Forage Land. (2004 Campaign)
Tragsatec


Control Sites in Spain. Campaign 2004
VHR sites:
Ikonos
Quick Bird
VILA
SDOM
ALMO
SANE
PADI
CORI
FUEN
VITO
PERA
XLJU
SANT
CONTROL POR TELEDETECCIÓN 2004
MAPA DE LOCALIZACIÓN DE TODAS LAS ZONAS
ENERO 2004

VHR & HR Test of per pixel classification in Spain

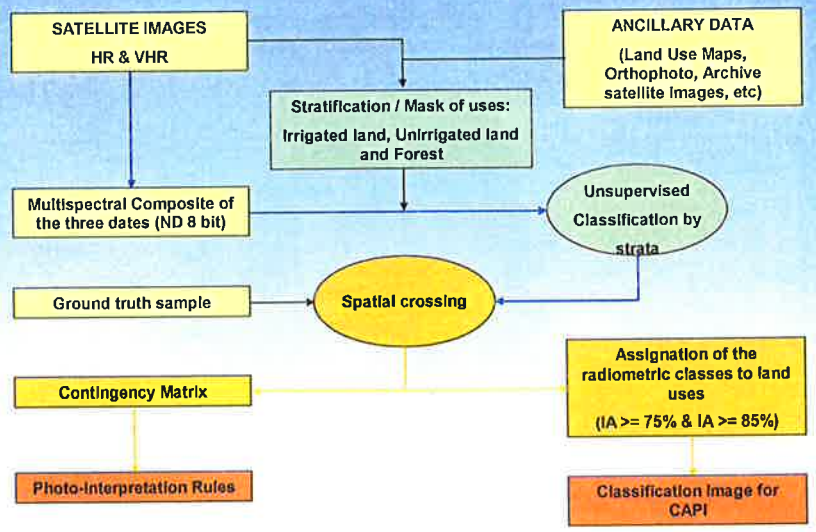
In Spain, automatic per-pixel classifications (isodata algorithm) based on multitemporal HR images are usually performed as a support to the interpreter for crop identification.

- Test 1: To assess the potential of VHR in terms of spatial resolution
  3 Spanish sites were classified substituting the second spring MR Sp4 image by a VHR. Two classification were compared using the same set of images resample to:
  - VHR resolution
  - HR resolution

- Test 2: To assess the importance of the spectral resolution on the classification accuracy
  Carried out in ALMO site (Aragón). One SP4 XI image from May was added to the initial set of HR&VHR imagery to be classified in order to increase the spectral discrimination between flooded parcels of rice and maize.

VHR & HR Test of per pixel classification in Spain

Methodology of classification



Test 1: The influence of the spatial resolution in the classification process

Methodology:

Two classifications have been compared:

1) Degrading the spatial resolution of VHR images to HR images resolution:
   - the IK + HR + MR images to 10 meters pixel size
   - the QB + HR + MR images to 5 meters pixel size
2) Resampling the HR/MR images to the VHR original data resolution:
   - the IK + HR + MR images to 4 meters pixel size
   - the QB + HR + MR images to 2,5 meters pixel size

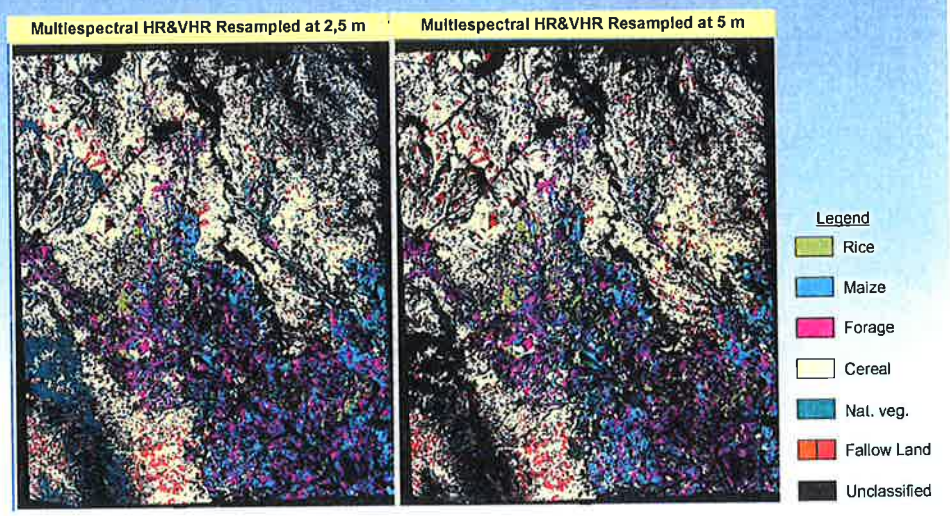
Test 1: The influence of the spatial resolution in the classification process

Analysis of results:

- Analysis of the Contingency Matrix per each VHR site.
- Comparison of the correctly classified surface obtained in the different classifications with a ground truth sample.

Test 1: The influence of the spatial resolution in the classification process

Classification with different spatial resolution in ALMO



Test 1: The influence of the spatial resolution in the classification process

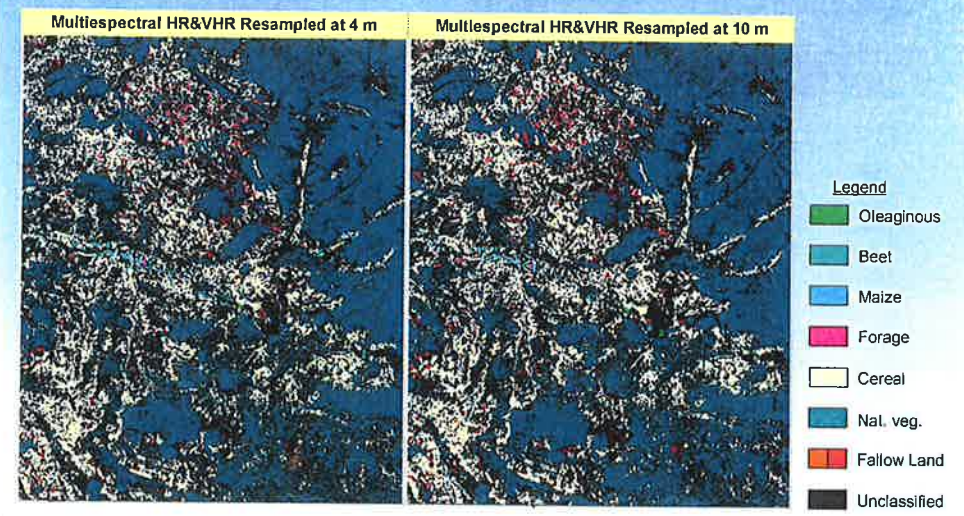
Contingency Matrix comparison between classification with different spatial resolution ALMO

USES	IA (%)			CA (%)		
	5m	2,5m	Variation %	5m	2,5m	Variation %
CEREAL	95,50	95,79	0,29	77,68	76,38	-1,30
RICE	94,33	91,74	-2,59	48,48	35,21	-13,27
MAIZE	95,02	92,34	-2,68	36,74	36,21	-0,53
FORAGE	91,73	91,38	-0,35	48,75	41,03	-7,72
FALLOW LAND	98,73	97,51	-1,22	31,66	32,66	1,00
NAT. VEGETATION	94,91	96,59	1,68	6,05	18,31	12,26

Comparison of the correctly classified surface obtained in the two classifications (2.5 & 5 m) with the ground truth.

Test 1: The influence of the spatial resolution in the classification process

Classification with different spatial resolution in SANE



Test 1: The influence of the spatial resolution in the classification process

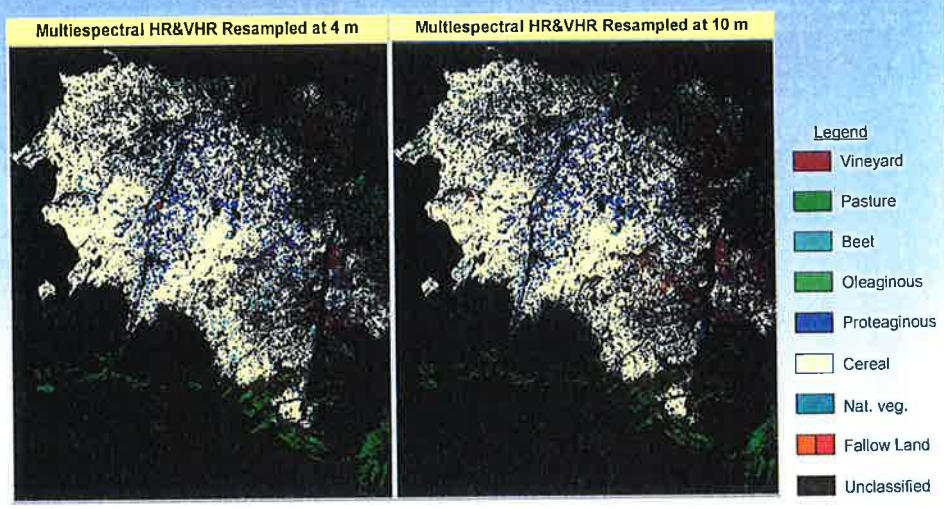
Contingency Matrix comparison between classification with different spatial resolution SANE

USES	IA (%)			CA (%)		
	4m	10m	Variation % (10m over 4m)	4m	10m	Variation % (10m over 4m)
CEREAL	94,52	94,58	0,06	72,82	76,49	3,67
MAIZE	85,19	95,61	10,42	10,36	3,10	-7,26
BEET	93,61	94,44	0,83	42,26	44,28	2,02
FORAGE	97,40	99,62	2,22	93,04	93,79	0,75
FALLOW LAND	91,46	91,09	-0,37	24,33	19,85	-4,48
NAT. VEGETATION	99,45	99,60	0,15	82,18	80,89	-1,29

Comparison of the correctly classified surface obtained in the two classifications (4 & 10 m) with the ground truth.

Test 1: The influence of the spatial resolution in the classification process

Classification with different spatial resolution in SDOM



Test 1: The influence of the spatial resolution in the classification process

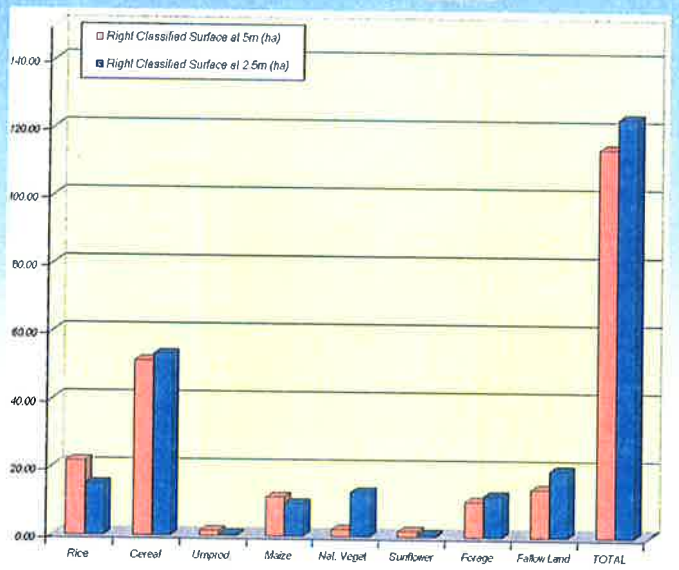
Contingency Matrix comparison between classification with different spatial resolution SDOM

USES	IA (%)			CA (%)		
	4m	10m	Variation % (10m over 4m)	4m	10m	Variation % (10m over 4m)
CEREAL	97,90	98,77	**0,87**	90,84	91,28	**0,44**
BEET	91,67	92,64	**0,97**	21,91	17,63	**-4,28**
OLEAGINOUS	91,89	92,13	**0,24**	15,64	5,63	**-10,01**
VINEYARD	94,77	94,87	**0,10**	18,48	19,13	**0,65**
PASTURE	91,08	94,07	**2,99**	19,96	27,43	**7,47**
PROTEAGINOUS	94,56	95,56	**1,00**	43,73	50,35	**6,62**

Comparison of the correctly classified surface obtained in the two classifications (4 & 10 m) with the ground truth.

Test 1: The influence of the spatial resolution in the classification process

Results: Comparison with the ground truth sample and rapid visit field in small parcels <0.3 ha

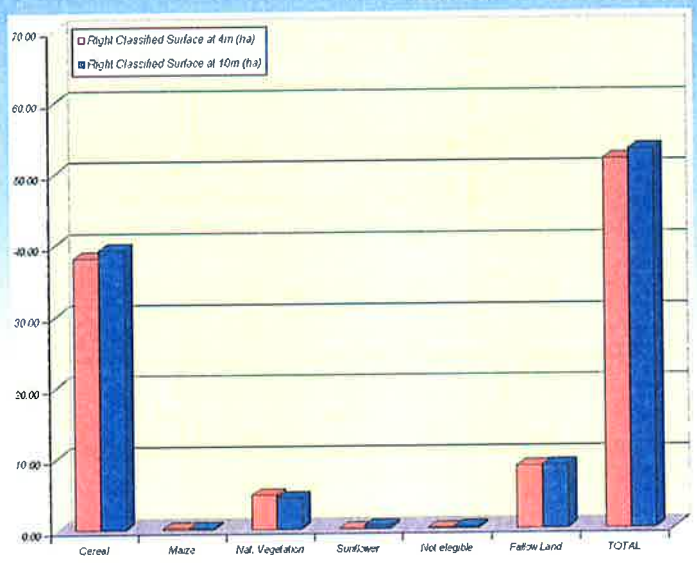


ALMO

The number of small parcels sampled is 5,073 (land use subparcels).

Test 1: The influence of the spatial resolution in the classification process

Results: Comparison with the ground truth sample and rapid visit field in small parcels <0.3 ha

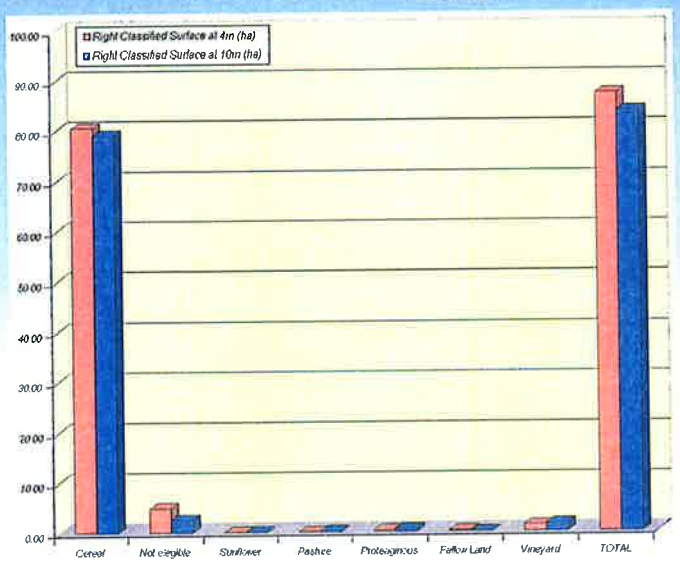


SANE

The number of small parcels sampled is 1,957 (land use subparcels).

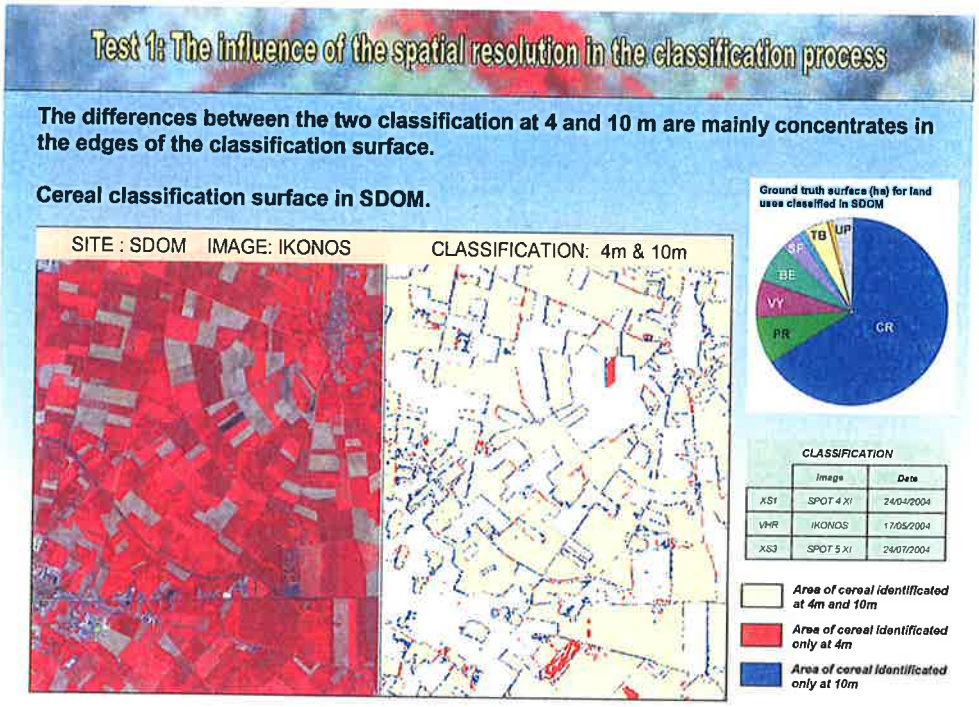
Test 1: The influence of the spatial resolution in the classification process

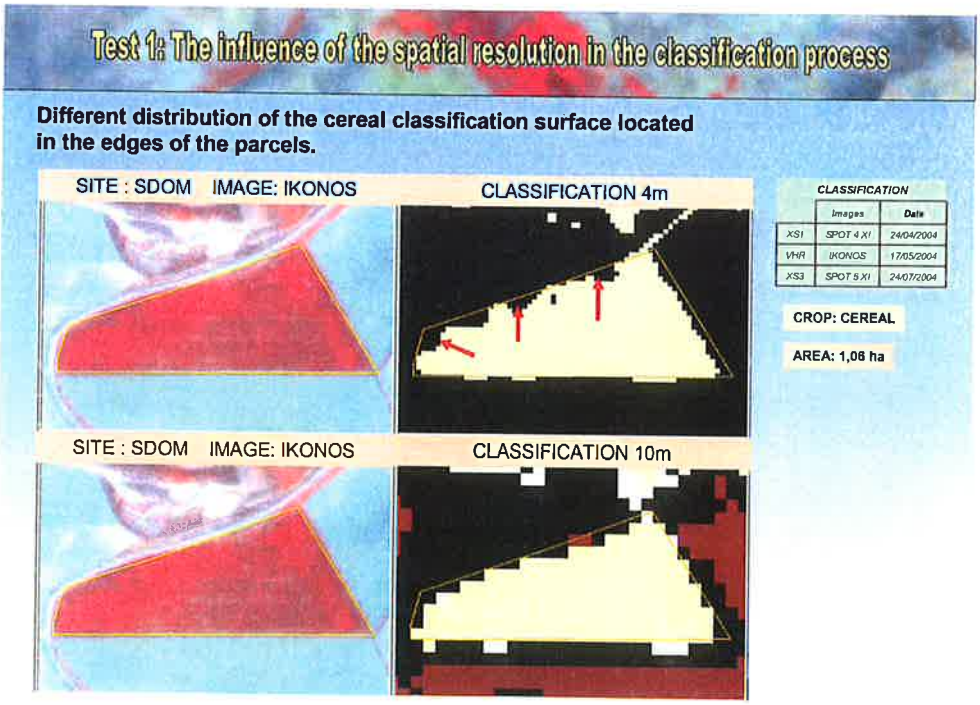
Results: Comparison with the ground truth sample and rapid visit field in small parcels <0.3 ha

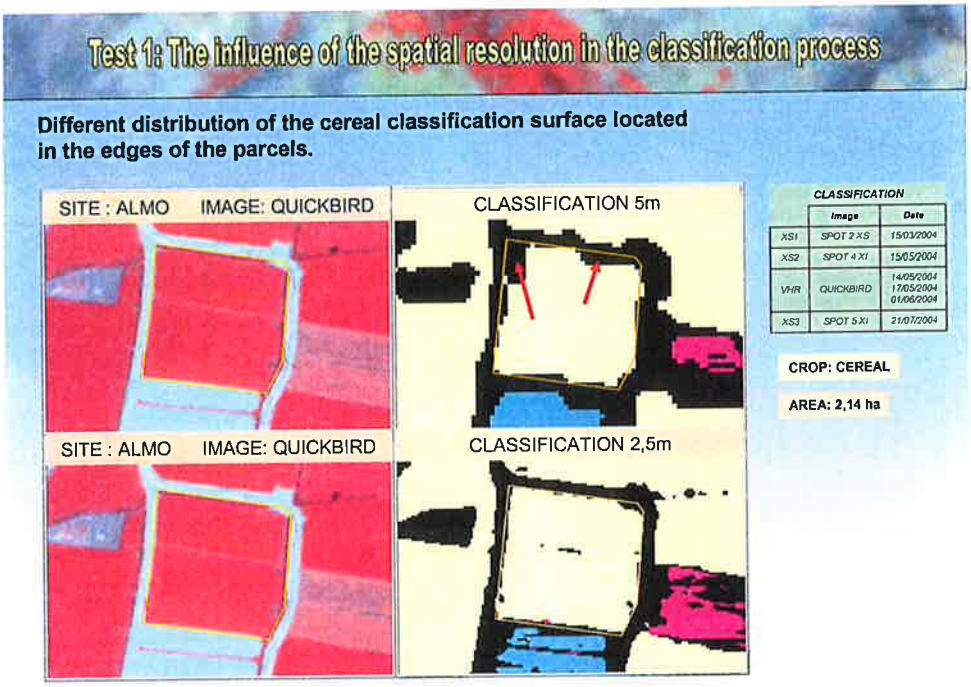


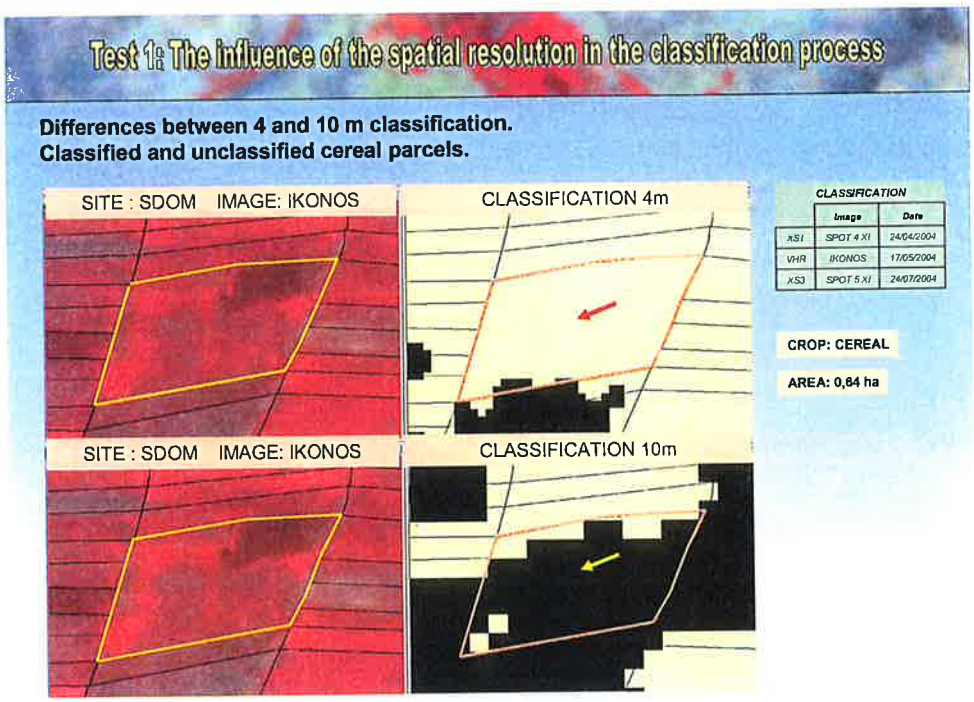
SDOM

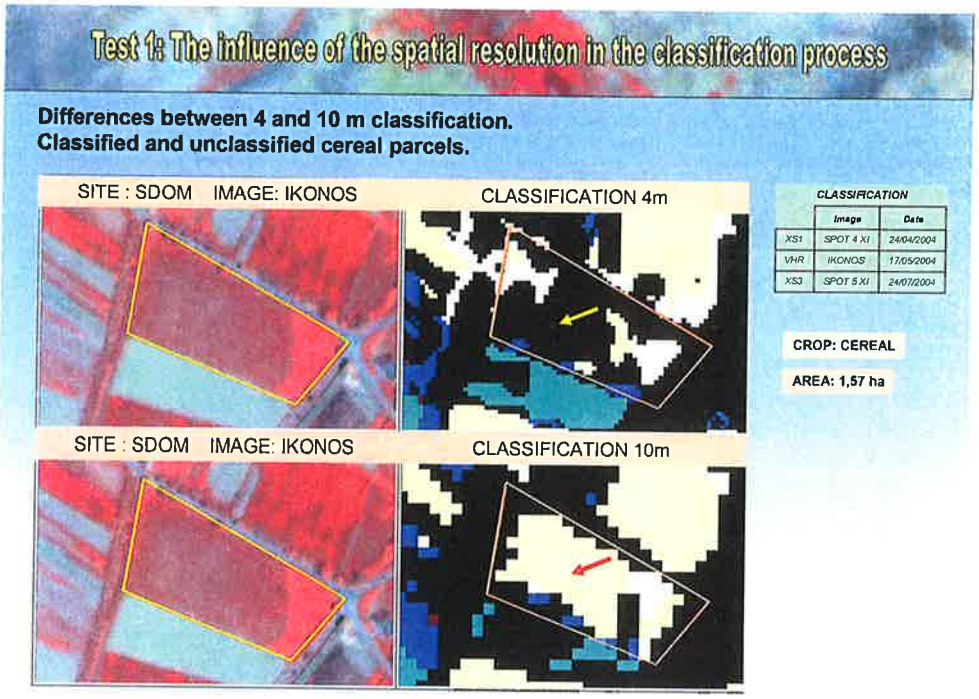
The number of small parcels sampled is 2,114 (land use subparcels).

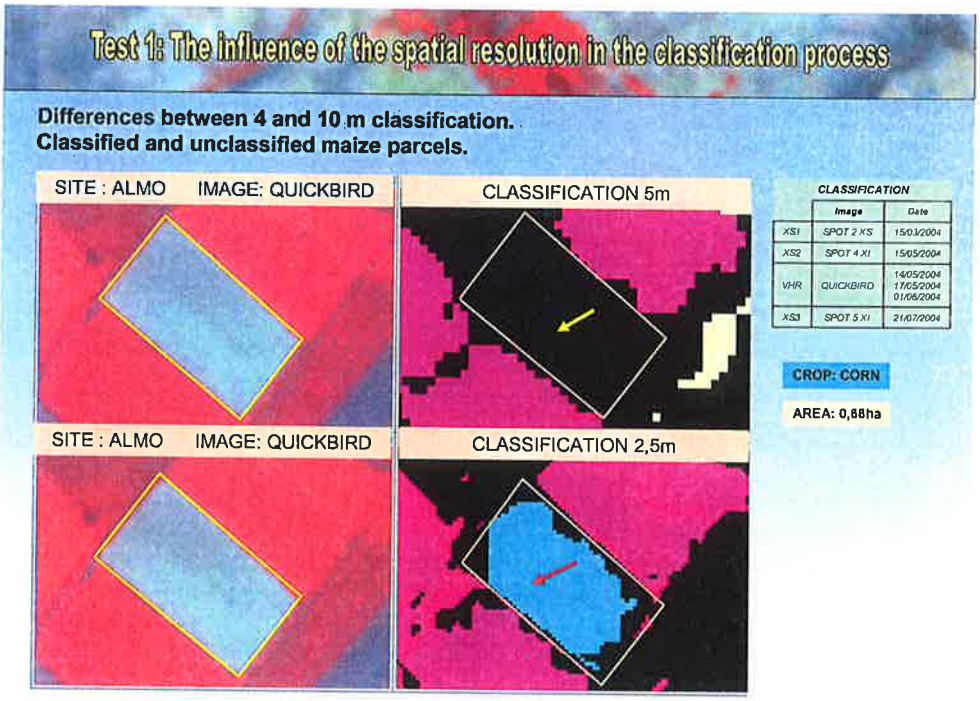

Test 1: The influence of the spatial resolution in the classification process
The differences between the two classification at 4 and 10 m are mainly concentrates in the edges of the classification surface.
Cereal classification surface in SDOM.
SITE : SDOM IMAGE: IKONOS
CLASSIFICATION: 4m & 10m
Ground truth surface (ha) for land uses classified in SDOM
UP
TB
SF
BE
VY
PR
CR
CLASSIFICATION
Image
Date
XS1 SPOT 4 XI 24/04/2004
VHR IKONOS 17/05/2004
XS3 SPOT 5 XI 24/07/2004
Area of cereal identificated at 4m and 10m
Area of cereal identificated only at 4m
Area of cereal identificated only at 10m


Test 1: The influence of the spatial resolution in the classification process
Different distribution of the cereal classification surface located in the edges of the parcels.
SITE : SDOM IMAGE: IKONOS
CLASSIFICATION 4m
SITE : SDOM IMAGE: IKONOS
CLASSIFICATION 10m
CLASSIFICATION
Images
Date
XS1 SPOT 4 XI 24/04/2004
VHR IKONOS 17/05/2004
XS3 SPOT 5 XI 24/07/2004
CROP: CEREAL
AREA: 1,06 ha


Test 1: The influence of the spatial resolution in the classification process
Different distribution of the cereal classification surface located in the edges of the parcels.
SITE : ALMO IMAGE: QUICKBIRD
CLASSIFICATION 5m
SITE : ALMO IMAGE: QUICKBIRD
CLASSIFICATION 2,5m
CLASSIFICATION
Image
Date
XS1 SPOT 2 XS 15/03/2004
XS2 SPOT 4 XI 15/05/2004
VHR QUICKBIRD 14/05/2004 17/05/2004 01/06/2004
XS3 SPOT 5 XI 21/07/2004
CROP: CEREAL
AREA: 2,14 ha

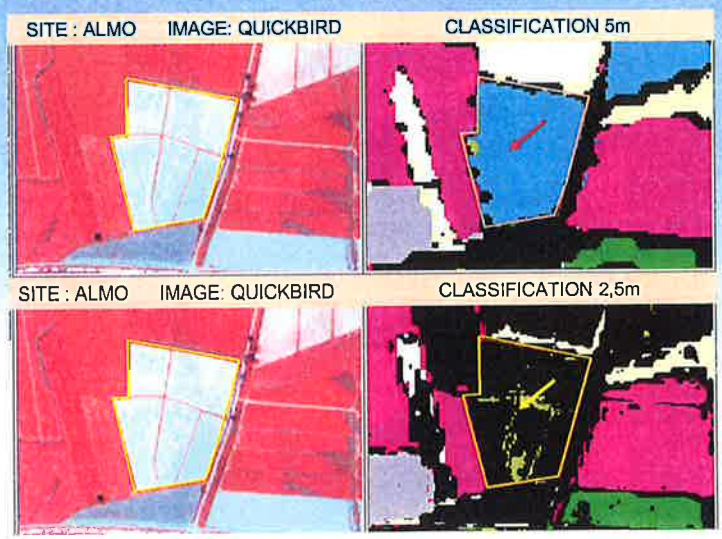

Test 1: The influence of the spatial resolution in the classification process
Differences between 4 and 10 m classification.
Classified and unclassified cereal parcels.
SITE : SDOM IMAGE: IKONOS
CLASSIFICATION 4m
SITE : SDOM IMAGE: IKONOS
CLASSIFICATION 10m
CLASSIFICATION
Image
Date
XS1 SPOT 4 XI 24/04/2004
VHR IKONOS 17/05/2004
XS3 SPOT 5 XI 24/07/2004
CROP: CEREAL
AREA: 0,64 ha


Test 1: The influence of the spatial resolution in the classification process
Differences between 4 and 10 m classification.
Classified and unclassified cereal parcels.
SITE : SDOM IMAGE: IKONOS
CLASSIFICATION 4m
SITE : SDOM IMAGE: IKONOS
CLASSIFICATION 10m
CLASSIFICATION
Image
Date
XS1 SPOT 4 XI 24/04/2004
VHR IKONOS 17/05/2004
XS3 SPOT 5 XI 24/07/2004
CROP: CEREAL
AREA: 1,57 ha


Test 1: The influence of the spatial resolution in the classification process
Differences between 4 and 10 m classification.
Classified and unclassified maize parcels.
SITE : ALMO IMAGE: QUICKBIRD
CLASSIFICATION 5m
SITE : ALMO IMAGE: QUICKBIRD
CLASSIFICATION 2,5m
CLASSIFICATION
Image
Date
XS1 SPOT 2 XS 15/03/2004
XS2 SPOT 4 XI 15/05/2004
VHR QUICKBIRD 14/05/2004 17/05/2004 01/06/2004
XS3 SPOT 5 XI 21/07/2004
CROP: CORN
AREA: 0,68ha

Test 1: The influence of the spatial resolution in the classification process

Differences between 4 and 10 m classification.
Classified and unclassified maize parcels.



CLASSIFICATION

	Image	Date
XS1	SPOT 2 XS	15/03/2004
XS2	SPOT 4 XI	15/05/2004
VHR	QUICKBIRD	14/05/2004 17/05/2004 01/06/2004
XS3	SPOT 5 XI	21/07/2004

CROP: CORN

AREA: 3,73ha

Test 2: The importance of spectral resolution in classification accuracy

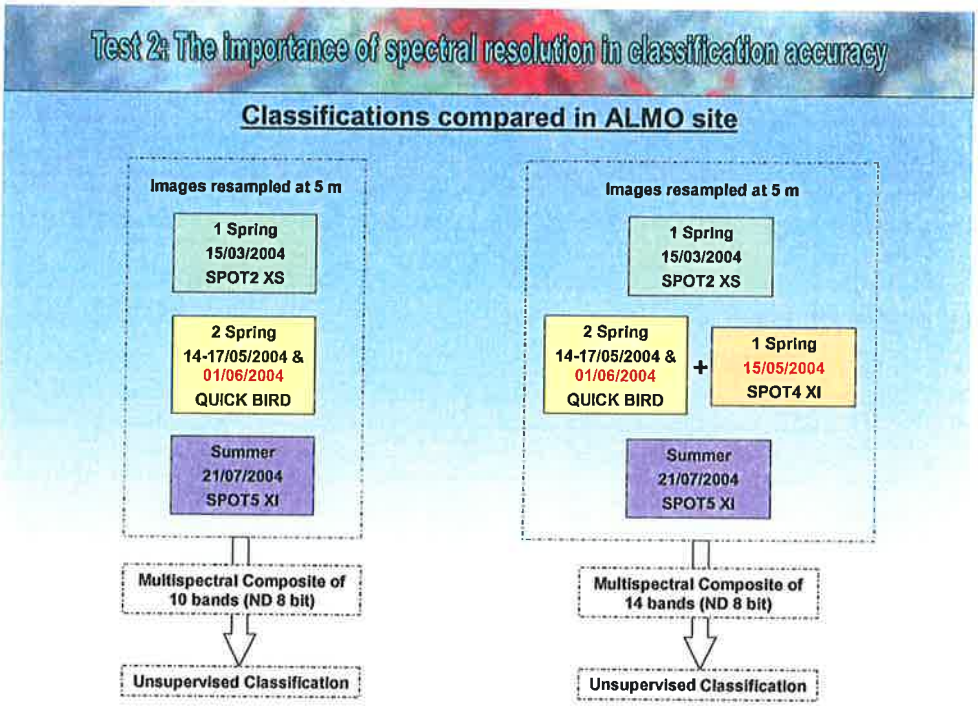
One SP4 XI image from May was added to the initial set of MR/HR&VHR imagery to be classified in order to increase the spectral discrimination between the flooded parcels of rice and maize.

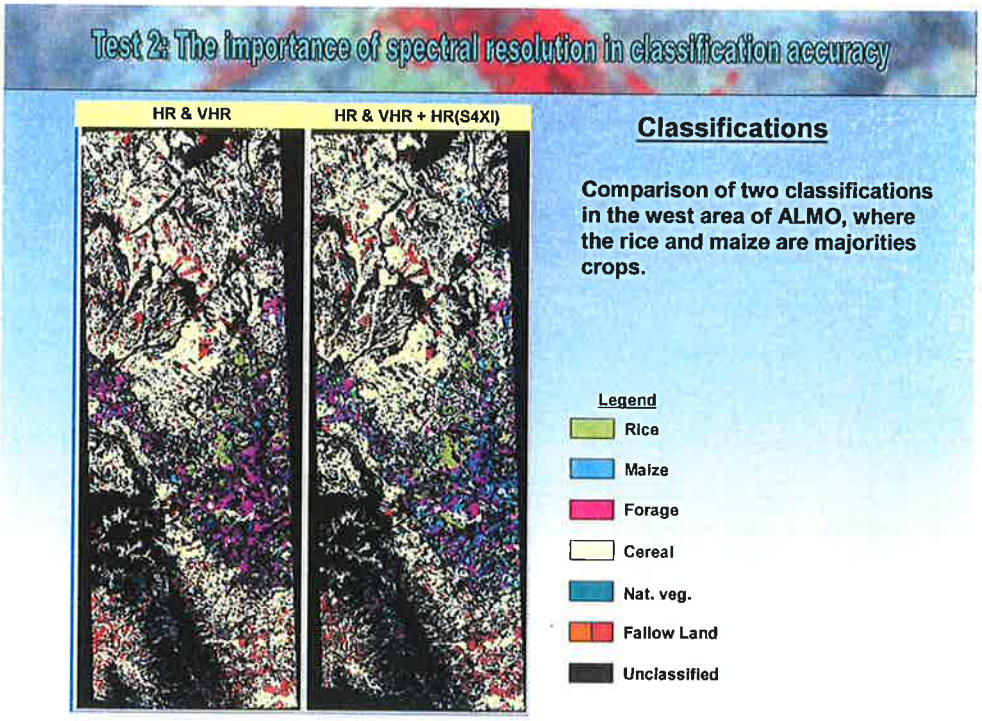
Two classification were compared in the west side of ALMO site (Aragón), both at 5 meters resolution:

- MR + QB + HR
- MR + QB + MR backup image + HR

The use of the backup image (Spot 4 XI, 15th of May) was very useful in the discrimination of the rice and maize due to two factors:

- The additional band, SWIR of Spot 4 XI, where the water is easily isolated.
- The differences of 15 days between the Spot and QB image.


Test 2: The importance of spectral resolution in classification accuracy
Classifications compared in ALMO site
Images resampled at 5 m
1 Spring 15/03/2004 SPOT2 XS
2 Spring 14-17/05/2004 & 01/06/2004 QUICK BIRD
Summer 21/07/2004 SPOT5 XI
Multispectral Composite of 10 bands (ND 8 bit)
Unsupervised Classification
Images resampled at 5 m
1 Spring 15/03/2004 SPOT2 XS
2 Spring 14-17/05/2004 & 01/06/2004 QUICK BIRD
+
1 Spring 15/05/2004 SPOT4 XI
Summer 21/07/2004 SPOT5 XI
Multispectral Composite of 14 bands (ND 8 bit)
Unsupervised Classification


Test 2: The importance of spectral resolution in classification accuracy
HR & VHR
HR & VHR + HR(S4XI)
Classifications
Comparison of two classifications in the west area of ALMO, where the rice and maize are majorities crops.
Legend
Rice
Maize
Forage
Cereal
Nat. veg.
Fallow Land
Unclassified

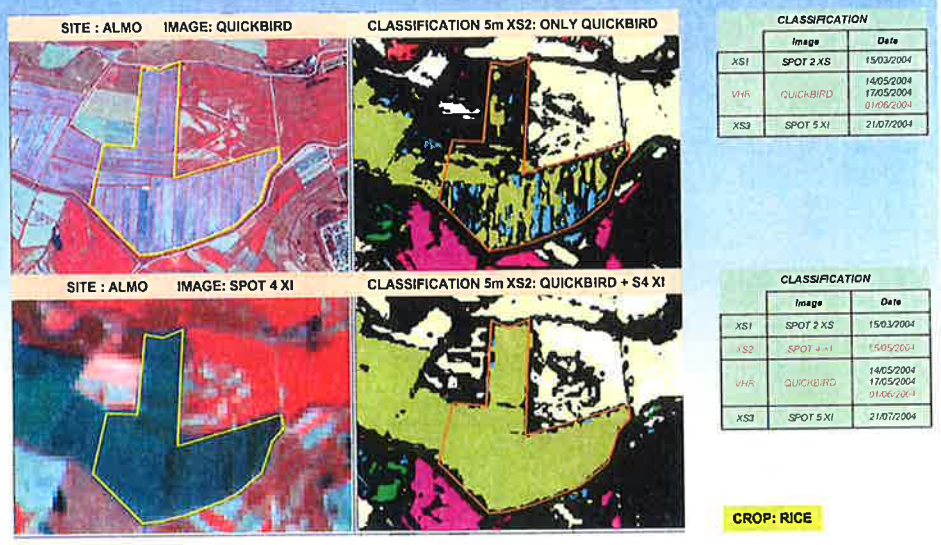
Test 2: The importance of spectral resolution in classification accuracy

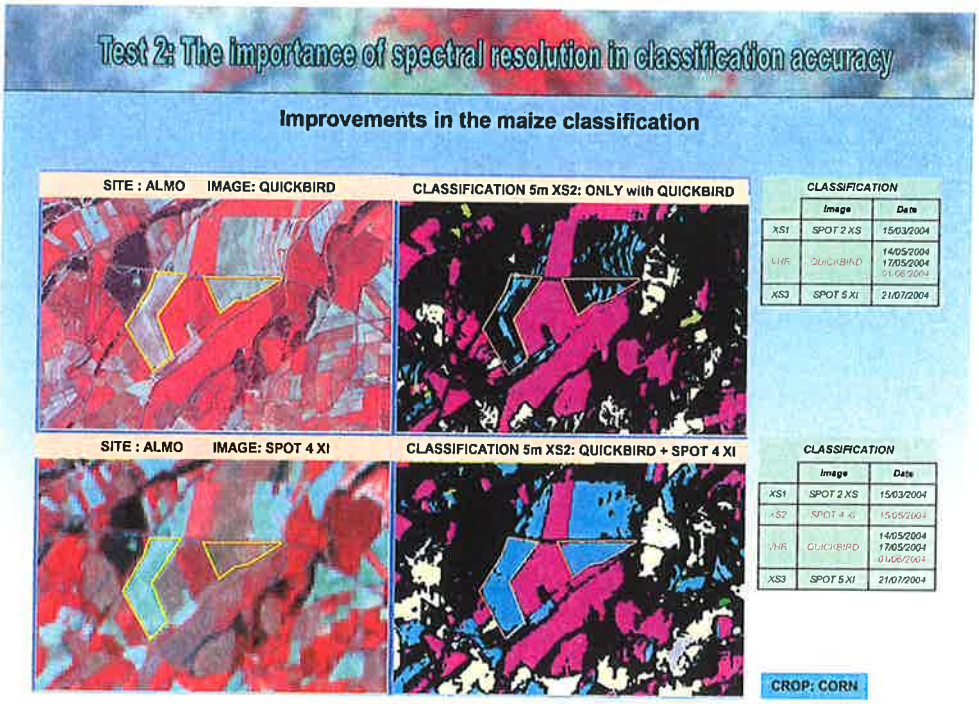
Contingency Matrix comparison between classification with and without S4 XI (backup image)

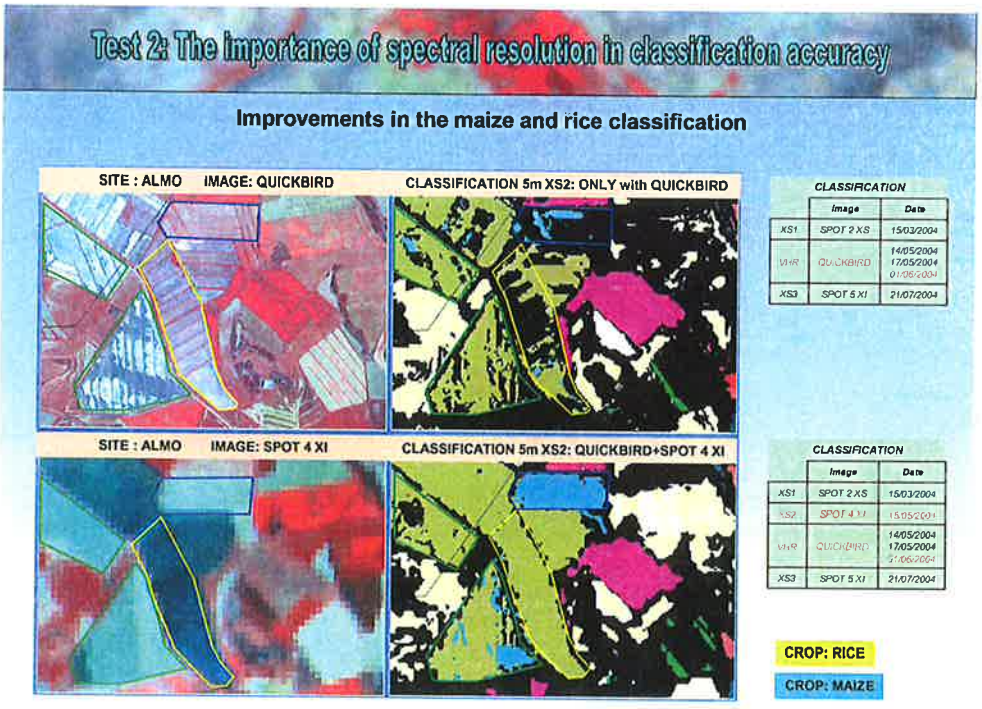
USES	IA (%)			CA (%)		
	without S4 XI (backup image)	with S4 XI (backup image)	Improvement %	without S4 XI (backup image)	with S4 XI (backup image)	Improvement %
CEREAL	95.85	95.92	0.07	71.95	77.64	5.69
RICE	95.73	99.56	3.83	33.65	83.69	50.04
MAIZE	0.00	92.44	92.44	0.00	61.94	61.94
OLEAGINOUS	85.47	87.61	2.14	5.85	9.59	3.74
FORAGE	89.13	87.81	-1.32	49.10	54.84	5.74
FALLOW LAND	93.56	95.54	1.98	35.74	44.45	8.71
NAT. VEGET.	97.50	97.28	-0.22	13.81	11.43	-2.38
UMPRODUCT.	93.71	91.67	-2.04	11.18	8.18	-3.00

Test 2: The importance of spectral resolution in classification accuracy

Improvements in the rice classification




Test 2: The importance of spectral resolution in classification accuracy
Improvements in the maize classification
SITE : ALMO IMAGE: QUICKBIRD
CLASSIFICATION 5m XS2: ONLY with QUICKBIRD
SITE : ALMO IMAGE: SPOT 4 XI
CLASSIFICATION 5m XS2: QUICKBIRD + SPOT 4 XI
CLASSIFICATION
Image
Date
XS1
SPOT 2 XS
15/03/2004
VHR
QUICKBIRD
14/05/2004
17/05/2004
01/06/2004
XS3
SPOT 5 XI
21/07/2004
CLASSIFICATION
Image
Date
XS1
SPOT 2 XS
15/03/2004
XS2
SPOT 4 XI
15/05/2004
VHR
QUICKBIRD
14/05/2004
17/05/2004
01/06/2004
XS3
SPOT 5 XI
21/07/2004
CROP: CORN


Test 2: The importance of spectral resolution in classification accuracy
Improvements in the maize and rice classification
SITE : ALMO IMAGE: QUICKBIRD
CLASSIFICATION 5m XS2: ONLY with QUICKBIRD
SITE : ALMO IMAGE: SPOT 4 XI
CLASSIFICATION 5m XS2: QUICKBIRD+SPOT 4 XI
CLASSIFICATION
Image
Date
XS1
SPOT 2 XS
15/03/2004
VHR
QUICKBIRD
14/05/2004
17/05/2004
01/06/2004
XS3
SPOT 5 XI
21/07/2004
CLASSIFICATION
Image
Date
XS1
SPOT 2 XS
15/03/2004
XS2
SPOT 4 XI
15/05/2004
VHR
QUICKBIRD
14/05/2004
17/05/2004
01/06/2004
XS3
SPOT 5 XI
21/07/2004
CROP: RICE
CROP: MAIZE

CONCLUSIONS TEST 1

- There are not a significant improvement in the classification results when the MR (20 m) and HR (10 m) images are resampled to VHR resolution.
- The difference of the right classified surface for both compared classifications is <3%, independently of the type of crop and even for small parcels (<0,3 ha)
- At VHR original resolution, the results of classification are more accuracy when the summer image is a HR (ALMO and SDOM sites with: Spot 5 XI, 10 m and 4 bands) than when is a MR (SANE site with: Spot 2 XS, 20 m and 3 bands).
- The main discrepancies between both classifications are located in the border areas as a consequence of the resampling process of the images involved in the classification.

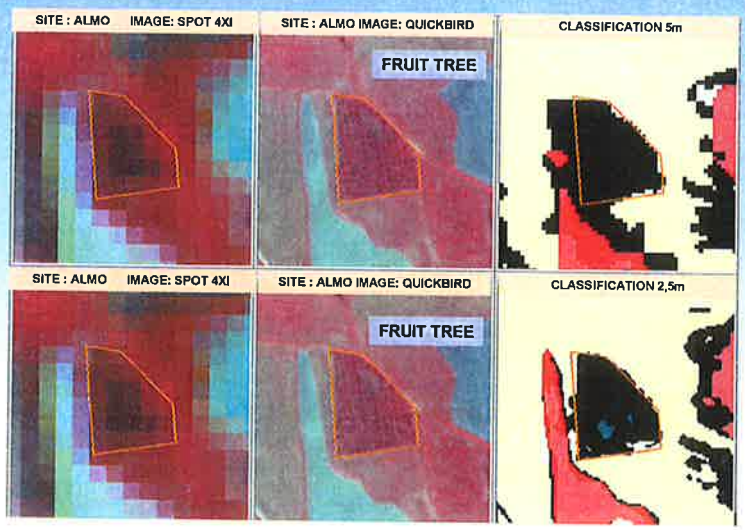
CONCLUSIONS TEST 2

- In a multiespectral classification process, the improvements in crop recognition are directly related to two elements:
  - the spectral resolution of the images
  - the use of properly dates of images
- For the spectral discrimination of flooded parcels of rice is very important the use of SP4 SWIR band.
- Although maize has more vegetative activity in the date of the QB image (01 /06/2004) is better discriminated in the classification done with the SP4 image (15/05/2004).

CONCLUSIONS

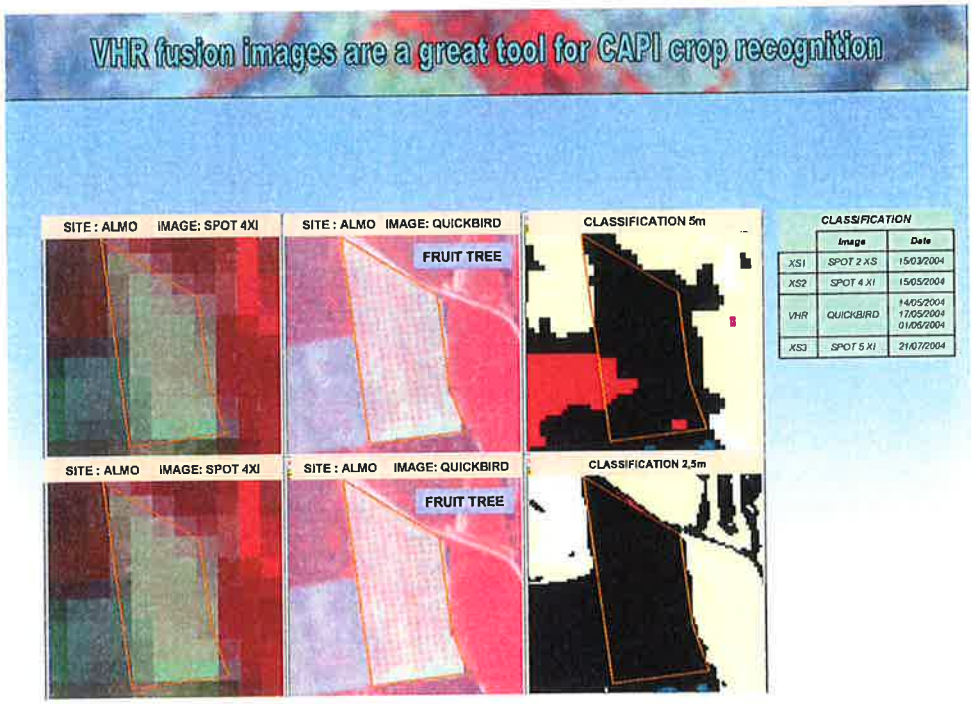
- The use of a multitemporal- multiresolution per-pixel isodata classification with just one VHR image date has not further improved crop recognition.
- An additional VHR summer image could help to increase the classification results for crops like maize, beet, sunflower, vineyard, etc.
- In any case… VHR fusion images are a demonstrated valuable tool for improving CAPI crop recognition results.

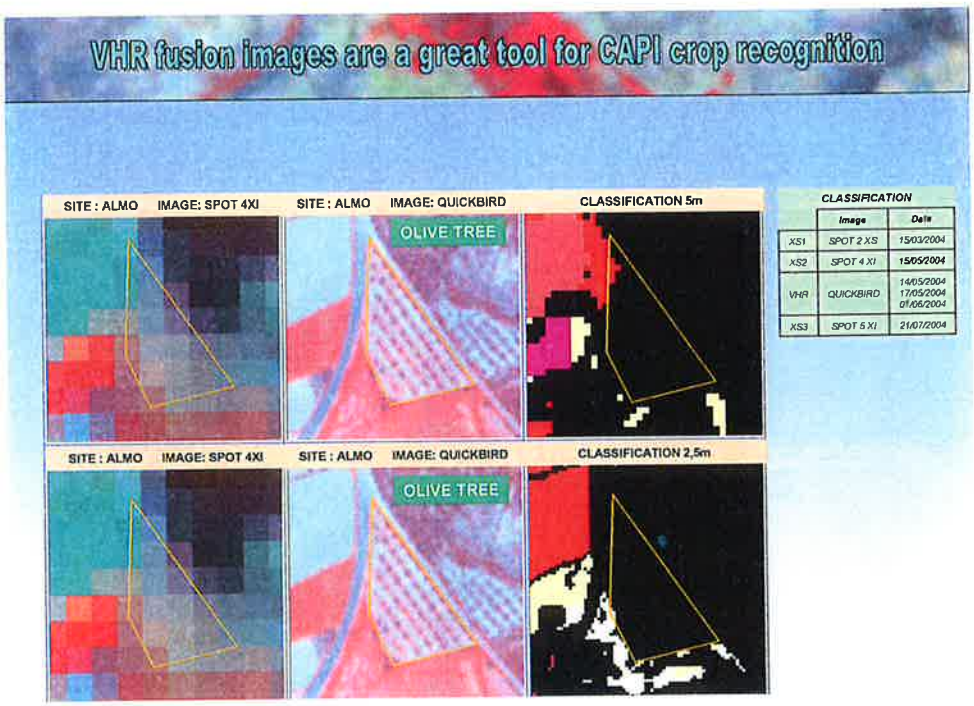
VHR fusion images are a great tool for CAPI crop recognition

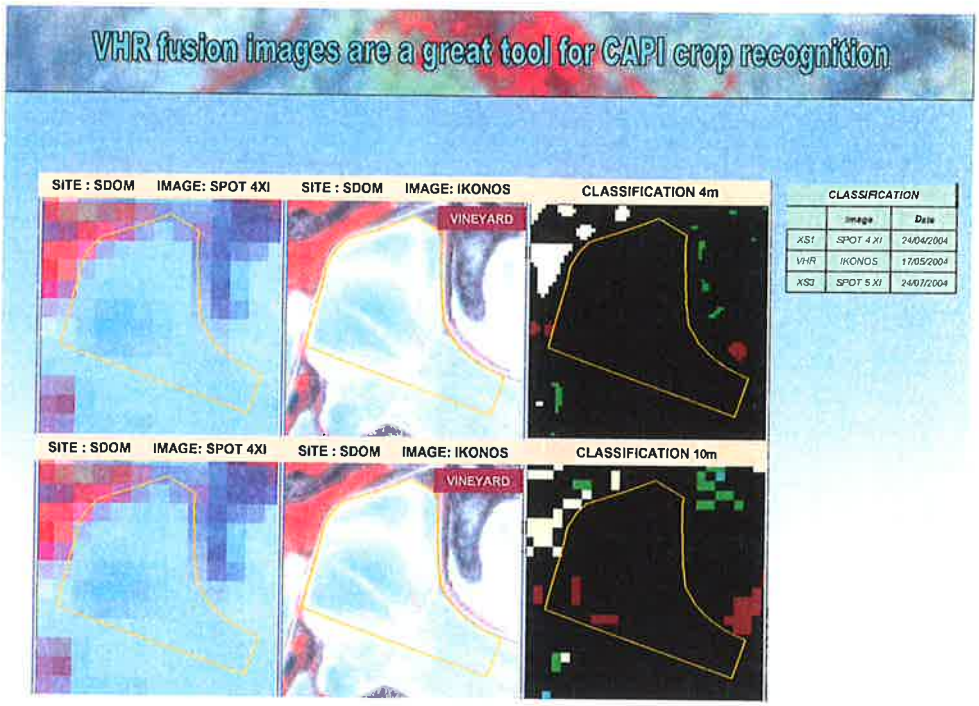


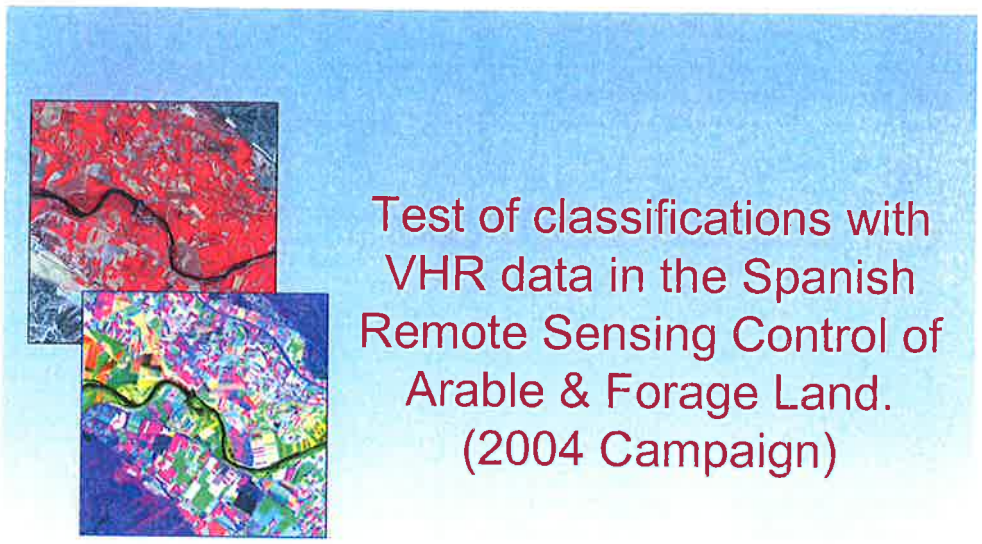
CLASSIFICATION

	Image	Date
XS1	SPOT 2 XS	15/03/2004
XS2	SPOT 4 XI	15/05/2004
VHR	QUICKBIRD	14/05/2004 17/05/2004 01/06/2004
XS3	SPOT 5 XI	21/07/2004


VHR fusion images are a great tool for CAPI crop recognition
SITE : ALMO IMAGE: SPOT 4XI
SITE : ALMO IMAGE: QUICKBIRD
FRUIT TREE
CLASSIFICATION 5m
SITE : ALMO IMAGE: SPOT 4XI
SITE : ALMO IMAGE: QUICKBIRD
FRUIT TREE
CLASSIFICATION 2,5m
CLASSIFICATION
Image
Date
XS1
SPOT 2 XS
15/03/2004
XS2
SPOT 4 XI
15/05/2004
VHR
QUICKBIRD
14/05/2004
17/05/2004
01/05/2004
XS3
SPOT 5 XI
21/07/2004


VHR fusion images are a great tool for CAPI crop recognition
SITE : ALMO IMAGE: SPOT 4XI
SITE : ALMO IMAGE: QUICKBIRD
OLIVE TREE
CLASSIFICATION 5m
SITE : ALMO IMAGE: SPOT 4XI
SITE : ALMO IMAGE: QUICKBIRD
OLIVE TREE
CLASSIFICATION 2,5m
CLASSIFICATION
Image
Date
XS1
SPOT 2 XS
15/03/2004
XS2
SPOT 4 XI
15/05/2004
VHR
QUICKBIRD
14/05/2004
17/05/2004
01/06/2004
XS3
SPOT 5 XI
21/07/2004


VHR fusion images are a great tool for CAPI crop recognition
SITE : SDOM
IMAGE: SPOT 4XI
SITE : SDOM
IMAGE: IKONOS
CLASSIFICATION 4m
VINEYARD
CLASSIFICATION
Image
Date
XSI
SPOT 4 XI
24/04/2004
VHR
IKONOS
17/05/2004
XSJ
SPOT 5 XI
24/07/2004
SITE : SDOM
IMAGE: SPOT 4XI
SITE : SDOM
IMAGE: IKONOS
CLASSIFICATION 10m
VINEYARD


Test of classifications with VHR data in the Spanish Remote Sensing Control of Arable & Forage Land. (2004 Campaign)
Tragsatec

Session 4 – Definition of GAECs and possible Control of Cross Compliance

Chairman:

Axel HEIDER,
BMVEL, DE

Co-chairman:

Olivier LÉO,
JRC, IPSC, Agrifish Unit

Presentation 1 – Definition of GAECs and control of Cross Compliance

Olivier LÉO
JRC, IPSC, Agrifish Unit

Abstract

The introduction in 2005 of the cross-compliance is one of the main challenges of the CAP reform. The cross-compliance is an additional control / sanction mechanism aimed at reinforcing the respect by farmers of a number of European Directives or Regulations grouped in 3 areas (Environment, Public animal and plant heath, Animal welfare - ref. annex III of Regulation 1782/03) and of Good Agricultural and Environmental conditions (GAECs, ref. annex IV of this Regulation).

The CAP reform foresees a progressive implementation of the cross compliance in 3 years, the areas related to Environment and Animal identification & registration have to be implemented in 2005. However, the cross compliance with GAECs has to be fully implemented in 2005, and was already applicable in 2004 for 8 of the 10 new Member States opting for the SAPS scheme.

The implementation of cross-compliance is a complex issue: It involves different Ministries (typically Agriculture, Environment, Consumer Protection) and many agencies or specialised bodies may participate in its control (Veterinary services, Water and Environment Agencies, Police, etc).

The Good Agricultural and Environmental Conditions are a specific case, which may appear simpler because the definition and control of GAECs will involve, in most of the cases, the same ministry and the present control bodies. However, annex IV doesn't provide a list of Directives or Regulations to respect but just proposes a list of issues and standards. Member states have thus to define and implement their GAECs, to respond to the specificity of their environment and agriculture.

This presentation will introduce a number of concepts and indicate the distinctions to be made with the usual Good Farming practices or agri-environmental schemes of the 2nd Pillar. It will provide a summary of the information collected by JRC in 8 Member States and develop a number of recommendations on the definition and control of the GAECs (1st workshop on Cross compliancy and definition of GAECS- October 04, Ispra).

It will finally present the 2 main development axis identified in order to support by geomatic the implementation and control of cross compliance:

- Complementation of LPIS information; Remote access to IACS GIS databases for the different control bodies and specific information and advice to Farmers;
- Possible use of Remote Sensing to support the control of some GAECs requirements or for an element of risk analysis (selection of the sample to be controlled for the cross compliance).

Keywords: *CAP Reform, Cross-compliance, GAECs, Good Farming Practices, Control with Remote Sensing, IACS-GIS, FAS.*

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10th conference on Control with Remote Sensing

Budapest, 24-26 November 2004

Session 4: Control of Cross compliance with GAECS

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http://agrifish.jrc.it/marspac/default.htm

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Outline of the presentation

Why this Session?

- Some outputs of the 1st workshop on GAECs & Cross compliance

Support for the control of Statutory Management Requirements?

Recommendation on the definition of GAECs

Future use of CwRS for cross-compliance

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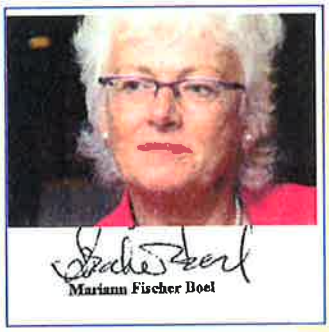
Hearing of our Commissioner Mrs Marianne FISCHER BOEL



"…… Decoupling and cross-compliance are now a part of the 1st pillar. The income support allows the farmers to produce what the market demands. The income support is not for free. To earn support farmers must respect the 18 requirements on environment, public, animal and plant health and animal welfare.

Farmers provide a vital service to our societies. They get paid in return - that is fair!

But decoupling and cross-compliance must be carried out correctly. I will therefore monitor new instruments closely in the Member States…"

European Parliament , Committee on Agriculture
6 October 2004

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Why this session ?

- Cross-compliance is one of the main challenge of the CAP reform
- A complex issue
  - involving different areas/ domains
  - Statutory Management requirements (SMRs) - Annex III
    - *With 3 domains & 3 Year progressive implementation*
  - + Good Agricultural & Environmental conditions (GAECs Annex IV)
- Requiring a lot of extra controls to be implemented by all MS in 2005
  - even for the MS keeping the full IACS till 2006…
- Transition for new MS
  - SAPS with only GAECs started in 2004 for 8 NMS
  - *Possible RD measures to support implementing European Standards*

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The 1st JRC workshop

"GAECS Definition and control of cross-compliance"

19-20 October 2004, in ISPRA

- **MARS PAC proposed this workshop**
  - Following the request of some MS expressed in Köln
  - a platform for discussion on technical issues
  - Focused on GAECS and technical issues
- **A panel of 9 MS :**
  BE (Wa & Fl), CZ, DE, DK, FR, HU, ITA, NL, UK (England).

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The 1st JRC workshop

- **3 sessions**
  - Session 1: Definition of GAECs / criteria & geographic extension
  - Session 2: Exchange of information for control of X-compliance.
  - Session 3: Possible use of RS in the control of X-compliance & especially GAECs.
- **20 presentations now available on our web site**
  http://agrifish.jrc.it/marspac/meetings/
  - Information purpose / no official position of the Commission
- **2005's follow-up being discussed with DG AGRI**
  - A questionnaire on GAECS to all MS ?
  - Preparation of a synthesis and recommendation doc?
  - Organisation of a 2nd workshop (EU25) ?

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General outputs of this workshop

1. **X compliance with SMR ?**
   - Priority in organisation of exchange with Control bodies
   - Interest of improving IACS GIS & Remote access to IACS and other databases
2. **X compliance with GAECs ?**
   - Important potential for controls supported by Remote sensing
   - But definition of GAECS is the key point
3. **New monitoring requirements**
   - Maintenance of permanent Grassland, etc

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X- compliance with S.M.R. (Annex III)

➢ **Involves several specialised Control Bodies**
- *Agriculture, Environment, Heath and consumer protection…*
- *with different target population, control methods and regional implementation…*

➢ **Key issues for X compliance identified by MS**

➢ ***unique or compatible Identification of farmers***
- *General organisation of control of X compliance*
  - Definition of populations, risk analysis, sampling rates…
- *Standardisation of reports by specialised control bodies*
  - Assessment of severity in case of non compliance
  - Definition of voluntary non compliance, reiteration, calculation and application of penalties…

➢ **Exchange of information between Control Bodies**

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Exchange of information between Control Bodies

- An efficient implementation of cross-compliance control with SMR
  - requires to integrate within IACS GIS other layers of info
    - Environmental Directives (Water Nitrate and Biodiversity)
  - Specialised Control bodies can benefit of having a direct access to IACS databases
    - LPIS and IACS GIS data ? Orthophotos ?
  - Could the digital LPIS constitute a common reference system?

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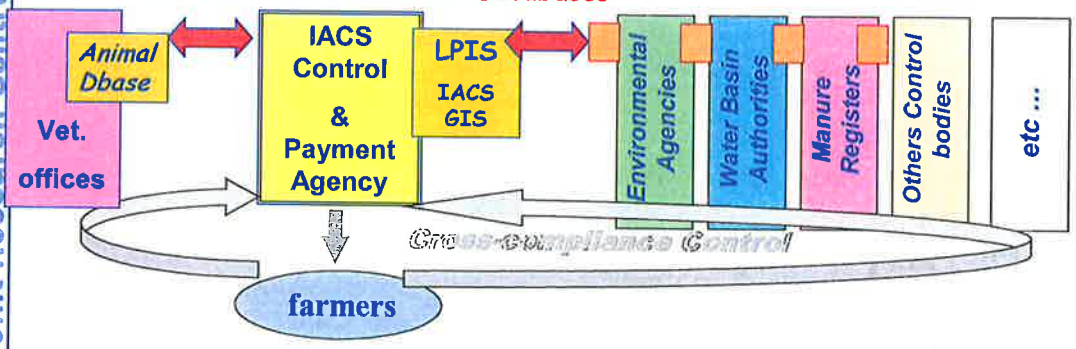
Exchange of information between Control Bodies

Future of the IACS-GIS ?

Remote Access to IACS Databases



NB: A similar concern to inform farmers (FAS): Appropriate and update information on EU directive (and GAECS) can be made available to farmers through IACS GIS....

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Specific interest for the GAECs

- GAECs are common for SAPS and CAP reform
  - Identical for "old" and New MS
- GAECs are generally defined by MoA
  - will generally involve the same Control Bodies than IACS controls
  - Easier to combine Sample and coordinate controls
- GAECs are linked to parcels (agricultural practice, land use, maintenance)
  - Possible support of LPIS orthophoto and CwRS
- Former experience of the 2nd Pillar
  - How similar are Good farming practices and GAECS

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Definition of GAECs and GFP ?

- (definition of GAECS has to be) … *"without prejudice to the standards governing Good Farming Practice … under the Rural Development … and to agri-environment measures…"* (1782/03 art. 5.1)

Good agricultural and environmental conditions <> *Usual Good Farming practices*

	1st pillar		2nd pillar	
	GAECs in SPS	GAEC in SAPS	UGFP	AEM
Legal basis	Reg.1782/03 annex IV & 96/04	Acc. Treaty + Annex III Reg 2199/2003	Reg. Counc.1257/1999 + 1783/2003 & Reg. Com 817/04	
Applied in	17 MS	8 NMS	25 MS	25 MS
When?	2005	2004 only	1999	1999
Reference eligibility	no	parcels in GAC in 2003	no	no
Function	X-compliance	X-compliance	Eligibility	Eligibility
Results	Penalties	Penalties	requirement	requirement
Area concerned	Entire holding	"Area" non-compliant	Entire holding	Area contracted
Level of sanction	5-15 %, cumulative effect	5-15 , cumulative effect	100% + possible retroactive	100%

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Definition of GAECs and GFP ?

- Important difference between GAECS and UGFP
  - *Clearly maintain a distinction between 1st and 2nd Pillar*
- But important to have a coherent set of rules
  - *GAECS & GFP apply to the same parcels, same farmers…*
- Content wise, some GAECS may be identical to some GFP
  - *The hierarchy is ensured through the function (eligibility/ sanction)*
- But GAECs and AEM are mutually exclusive

Good example in UK (ENG)
- GAECS requirements are including 7 existing GFP;
- 5 GAECS are implemented in replacement of future AE schemes

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Definition of the GAECs

- Annex IV provides only an indicative wish list
  - *with 4 issues*
  - *And a list of 10 standards*
- Member states have to define their own GAECS requirements
  - *according to their specific regional agricultural and environmental conditions / concerns*
- A preamble to answer to "Can we support the control of GAECs with Remote sensing ?" is
  - *How to choose, define and implement your GAECs?*

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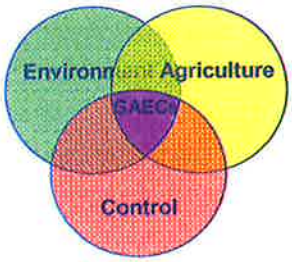
Definition of sustainable GAECs



GAECs have to be

- ***Relevant or appropriate for Environment***
- ***Acceptable or realistic for Farmers***
- ***Controllable*** *by the Control Agencies…*

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Definition of sustainable GAECs

- ***Relevant for Environment***
  - *Related to soil types / Physiographic Units*
    - to which geographic level of detail?
    - balance between generic or area-specific GAECs?
- ***Acceptable or realistic for Farmers***
  - Strong differences between theory and practice
  - The purpose is more to fight against bad environment and agricultural conditions, than to introduce new good practices …
- ***Controllable*** *by the control agencies…*
  - *All the requirements have to be controllable*
  - *you will have to demonstrate how you did control them*

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Definition of sustainable GAECs

3 points of view to combine ⇒ Definition should involve

- M of Agriculture, Research Institutes or Extension services
- Paying & Control Agency
- Consultation with farmers Unions

It's not an easy target : requires some months

and a lot of pragmatism !

In summary,

- Better make it simple and clear for farmers & controllers !
  - *Again a support role of FAS*
- The definition of GAECs will condition the feasibility of their control and the tools to be used.

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Key concepts / Vocabulary of cross-compliance

AREAS of cross-compliance

Statutory Management Requirements
3 areas *(Annex III)*: *Environment; Public & animal & plant heath ; Animal welfare*

Good Agricultural & Environment. Conditions
1 area (GAECs) *(Annex IV)*:

EU

STANDARDS SMR
18 EU Directives or Regulations:
For instance: Bird Directive, Nitrate Directive, etc...

ISSUES
4: *Soil erosion; Soil organic matter; Soil structure; Minimum level of maintenance.*

STANDARDS
10 standards : *for instance, Crop rotation; Arable stubble management*

National Regulations implementing the EU Directives

MS

x REQUIREMENTS (or measures ?)
Practical modalities for implementing (a) standard (s)

y POINTS to CONTROLS (check list)
list of checks to perform to control cross-compliance

Criteria of severity

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Selection of GAECs in a few MS

	Issues / Standards	2005 BE (Fla)	2005 BE (Wa)	2005 DE	2005 DK	2004 CZ	2004 HU	2005 FR	2005 ITA *	2005 LT	2005 NL	2005 UK (Eng)	% of MS
erosion	1 / 1			✓	✓		✓	✓	✓	✓	✓	✓	80 %
	1 / 2	✓	✓✓			✓	✓✓✓						30 %
	1 / 3			✓		✓	✓✓						30 %
organic matter	2 / 1	✓		✓				✓	✓				40 %
	2 / 2	✓	✓	✓			✓✓	✓				✓	50 %
struc.	3 / 1		✓				✓✓ ✓		✓			✓	40 %
Level of maintenance.	4 / 1						✓	✓	✓	✓			40 %
	4 / 2	✓	✓✓	✓			✓		✓				40%
	4 / 3			✓			✓		✓		✓		40 %
	4 / 4	✓✓	✓✓✓	✓	✓✓✓		✓✓	✓	✓	✓		✓	80 %
Others			✓	✓	✓✓	(✓)		✓✓	(✓)				60 %
Total		6	10	8	6	3	16	7	8	3	2	4	6,6

Comments

- *The number of GAECS varies from 2 to 16 for this panel of MS (mean 6-7 requirements)*
- *A national GAECS may address one or several standards / issue ... or some issues which are not indicated in Annex IV*
- *Comparison is not so evident for problem of concept and vocabulary*
- *in IT, GAECS are regionalised, with default National GAECS*
- *in DE: following experience of 2nd Pillar, National coordination /Länder*

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Selection of GAECs Standards (cf Annex IV of Reg. 1782/2003)

Annex IV provides a list of concerns

- Which are frequently inter-related
  Soil organic matter // soil structure; Soil cover // soil erosion & soil organic matter; retain of landscape features, of terraces...
- Which is non limitative

Nat. GAECS requirements implemented by MS,

- are their practical translation for farmers
- Several Nat. GAECS may address the same standard
- a national GAECS may address several standards

ISSUE	/ Standard
1) SOIL EROSION - protect soil with appropriate measures	
1.1	Minimum soil cover
1.2	Minimum land management reflecting site specific conditions
1.3	Retain terraces
2) SOIL ORGANIC MATTER – Maintain soil organic matter through appropriate practices	
2.1	Standard for crop rotation where applicable
2.2	Arable stubble management
3) SOIL STRUCTURE - Maintain soil structure through appropriate machinery use	
3.1	Appropriate machinery use
4) MINIMUM LEVEL OF MAINTENANCE	
4.1	Minimum livestock stocking rates and/or appropriate regimes
4.2	Protect permanent pastures
4.3	Retention of landscape features
4.4	Avoiding encroachment of unwanted vegetation on agricultural land

Nat Requirement 1
Nat Requirement 4
Nat Requirement 2
Nat Requirement 3

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Definition of the requirements

- 4 levels of detail / definition
  - *the objective condition or status*
    - Which expertise is required to assess it objectively ?
  - *The practices required to achieve these conditions*
  - *The mean (enablers) required*
    - Type of machinery or equipment
    - May also include instruments such as fertiliser plan,
    - Evidences such as result of analysis, etc
  - *only the information / awareness*
    - Availability of a "White Book" on GAECs
    - training, etc.

Easier to control

Stronger result achievement

Be clear if these elements are only necessary.. or become sufficient ! ! !

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Definition of GAECs by Member States

- "Non standard" GAECS requirements may be retained
  - to integrate pre-existing "eco-conditionnality" concerns
    - *GAECS on irrigation (FR)*
  - For horizontal issues
    - *Obligation of declaring all the parcels of the farm (BE)*
    - *Educational or information issues*
  - For specific concern
    - *Minimum Maintenance of Olive Grove in Italy*
  - to reinforce/ implement some European Directives)
    - *Example FR (Environmental cover along water courses)*
    - *more generally in NMS where SMR doesn't apply yet.*

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Definition of GAECs by Member States

- **Geographic extension of GAECS**
  - Most of the GAECS are nationalised or regionalised
    - *cf UK, BE, ITA (with National GAECS per default)*
    - *National cf FR, DE, DK, NL, CZ, HU…*
  - Main obvious case of area specific GAECS
    - *GAECS on erosion, conditioned by slope categories*
    - *Cf GAECS limited to Zuid-Limburg (NL)*
- **Remote sensing / LPIS can provide information on slope**
  - Priority is to define in LPIS the parcels were the GAEC is applicable (cf CZ, BE, NL…)
    - *and to inform the farmer of it (LPIS / FAS)*

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Definition of GAECs by Member States

- **GAECS and time**
  - GAECS can be modified and improve every year
    - Also a big difference with GFP
    - An opportunity to correct weak implementation in early stage
  - Progressive implementation of GAECs

Case of SMPs (Soil Management Plans) in England

- From 2005, info to farmers (consolidated GAEC guidance on management of agricultural soils).
- in 2006, farmers / land managers draw up a simple risk-based Soil Management Plan;
- SMPs to be implemented from 2007.

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Candidate GAECs for CWRS ?

- **Minimum soil cover (Standard 1.1 Erosion Issue)**
  - ***80 % of the Panel*** *but strong variation between MS*
  - *often defined in critical Winter period*
  - *Can be combined with MO concern,*
  - *or maintenance of Set aside / or non cultivated land*
    - Black fallows (bare soil forbidden)
- **Crop rotation (Standard 2.1) & No burning of Stubbles/ residues (Standard 2.2) / Organic matter**
  - ***50 % of the Panel*** *some variation between MS*
    - Rotation of crop (year n & n-1 images) or % crop and land cover / whole farm (year n)
  - *Both strong potential support of CwRS*
    - Completeness depends of detailed definition or possible derogation / alternative (FR, DE)

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Candidate GAECs for CWRS ?

- **Minimum level of maintenance**
  - *Standard 4.4 (avoiding encroachment of unwanted vegetation on agricultural land)*
  - ***80 % of the Panel*** *but strong variation between MS*
    - Requirement can be expressed in result, or practices (cut every year, every 4-5 years all ligneous, etc…)
    - Species which are considered (or not) as alien or injurious weeds
  - *Clear support of CwRS / completeness depends on detailed requirements*
  - *In fact a concern already present in IACS (for Set aside)*

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Candidate GAECs for CWRS ?

- ***Standard 4.3* Retention of landscape Features *(but also applicable to 1.3 retain terraces)* 30% of the panel MS**
  - *A specific problematic: What is the original situation to be maintained? 2 possibilities*
    - An **independent exhaustive inventory in the LPIS** (from ortho imagery)
    - A **compulsory declaration by Farmers in 2005**, followed by a validation

      cf example in DE (Poster SH)
  - *Field inspection or CwRS will detect removal by farmer of these Landscape Features (Edges, terraces, etc)*

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Other candidate GAECs for CWRS ?

cf presentations of the session

- ***Implementation & control of GAECS in 2004 in Hungary***

  István LÁSZLÓ, FÖMI, HU
- ***Definition of GAECs in France and possible CwRS***

  Fleur FRANCOIS –CHEMERY, ONIC, FR
- ***Implementation & control of GAECS in 2004 in Czech Rep.***

  Lucia ŠAVELKOVÁ, SZIF, CZ

Other :

- ***Automated monitoring of landscape elements & support to cross-compliance in Schleswig-Holstein*** Poster by EFTAS (DE)
- ***2 Presentations of session 1*** A. Heider (DE), M. Pompioni (IT)

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How can we use R-Sensing to Control GAECS ?

- The exact definition of GAEC is as important as the standard, to assess
  - Its controllability by Remote sensing
  - The completeness of the control with RS.
- Practical support of Remote sensing
  - As an objective control tool
  - As a support to risk analysis (Fraud detection / selection of the 1 % within the 5 %)
- Proposal of the Commission for 2005 CwRS
  - Test both approaches
  - Provision of extra HR images for the control out of season requirements
  - Results to be evaluated end of 2005

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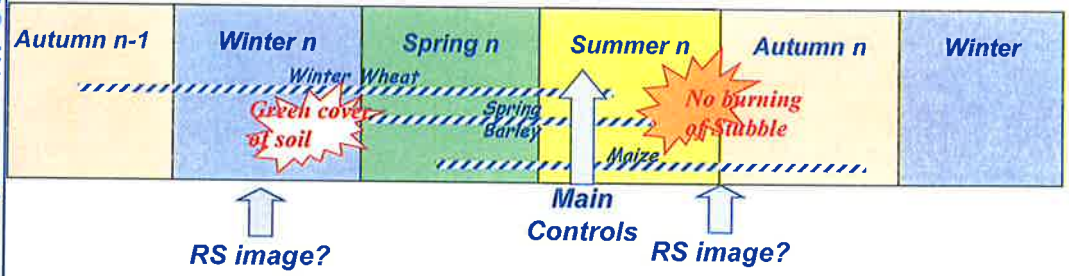
Possible use of R-Sensing to Control GAECS ?

- Strategic interest of Remote sensing?
  - Out-of-season requirements
    - Ex: Winter cover/ soil; No burning of stubble, etc….



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Practical issues of CWRS of GAECS ?

- **In most of the case**
  - **RS = support to control but uncompleted X C control**
    - *control of other GAECS by field & farm visit...*
    - *A fortiori of others SMR if same sample*
- **pay a specific attention**
  - **to date criteria**
  - **to whole farm criteria (% of crops in the rotation / code T Parcels)**
  - **To which campaign the GAECs is applicable**
    - *no green cover in winter 05 ⇒ 05-06 payment*
    - *burned stubbles in summer 05 ⇒ 04-05 payment*

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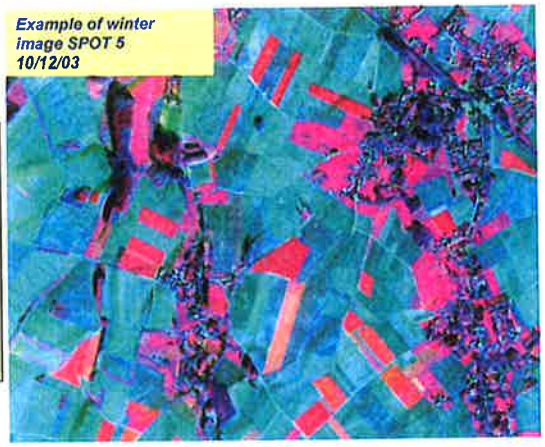
Technical issues ?

- **Assess technical feasibility in term of**
  - *solar angle , meteo conditions*
  - *Spot image agrees to make a validation on snow cover*
- ***BE intend to test in 2005 control of winter soil cover GAEC***
  - *(sloppy parcels)*
  - *risk analysis approach*
    - all sites with one optical image (1 Dec- 1 Feb)
    - One site with SAR series



- **Many other Research issues**
  - *a gold mine for Universities and Laboratories !*

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Other monitoring requirements

- **Maintenance of permanent pasture**
  - *A very specific issue considered as a 5th Area by some Member States* (articles 5/2 1782/03 and 3 & 4 of 796/04)
- **Case of BE (esp. Wa)**
  - *Strongly implemented by 3 requirements*
  - *+ horizontal GAECS on declaration of all parcels*
  - *specific control procedures on IACS / LPIS :*
    - identify and investigate Parcels "disappearing" from IACS
- **2 Options: individual control or regional monitoring**
  - *Statistical from IACS ? Objective survey?*
  - *Not an easy issue ...*

It takes one day to change a permanent grassland in arable, but it takes 5 years for a new grassland to become permanent ...

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Other monitoring requirements

- **More generally, GAECS provides instruments to avoid / reduce potential perverses effect of the CAP**
  - *But the effects can be dramatically opposed:*
  - *Abandonment of agriculture land:*
    - Cf. Standards 4.1- 4.4: Minimum maintenance of set aside, of grasslands
  - *Increase of arable lands*
    - With risk of over passing national ceilings
    - Cf GAEC on Maintenance of % permanent grasslands ... (article 5/2 1782/03)
- **But which will the area affected by one type of evolution or the other? Or a combination of the 2?**
  - *A strong requirement of an integrated monitoring combining objective survey and IACS analysis...*

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Thanks for your attention !

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Glossary of the a few Acronyms

	ENG	FR	DE
CC	Cross-compliance	Conditionnalité	Einhaltung anderweitiger Verpflichtungen
CwRS	Controls with Remote sensing	Contrôles par Télédétection	Kontrol mit Fernerkundung
FAS	Farm Advisory System	SCA (Système de Conseil Agricole)	Landwirtschaftliche Betriebsberatungssystem
GAECs	Good agricultural and environmental conditions	Bonnes conditions agricoles et environnementales	Guter landwirtschaftliche und ökologischer Zustand
GFP	Usual Good farming Practices (2nd Pillar)	BPAH Bonnes pratiques agricoles habituelles (2eme pilier)	Guter landwirtschaftliche und ökologischer Zustand
IACS	Integrated Administration and control System	SIGC (Système intégré de Gestion et de contrôle)	InVeKoS (Integriertes Verwaltungs und Kontrollsystems)
LPIS	Land Parcel identification System	SIPA (Système d'identification des parcelles agricoles)	FIS (Feld Identifizierung System)
SAPS	Single Area Payment Scheme for new M. States	Régime d'aide unique à la surface pour les nouveaux Etats Membres	?
SMRs	Statutory management requirements	Exigences réglementaires en matière de gestion	Grundanforderungen an die Betriebsführungen
SPS	Single Payment Scheme	Régime de paiement unique	Einheitlichen Betriebsprämie

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Presentation 2 – Implementation and control of GAECs in Hungary (2004)

Istvan. László
FÖMI, HU

Abstract

The presentation gives a technical overview of checking the GAEC issues in Hungary in 2004, emphasizing the standards that were controlled with remote sensing and GIS techniques.

Based on the Commission Regulation 2199/2004, in Hungary the National Rural Development Plan (NRDP) establishes the criteria of the Good Farming Practice (GFP) and, as a subset, those of the Good Agricultural and Environmental Conditions (GAEC). The respective MARD (Ministry of Agriculture and Rural Development) decree contains 16 standards grouped into the 4 issues set in 2199/2004.

In Hungary, the Institute of Geodesy, Cartography and Remote Sensing (FÖMI) carries out the remote sensing control of the area-based subsidies. In 2004, about 4% of the dossiers were controlled with remote sensing. Within this activity, three standards of GAEC were also controlled for all the selected dossiers. Two of the standards belong to the issue "Minimum level of maintenance", these were controlled in the frame of CAPI (Computer-Aided Photo-Interpretation). For the third one, belonging to "Soil erosion", non-interactive GIS techniques were used with DEM (Digital Elevation Map) and with the results of CAPI. Within the control sample, approximately 2% of the agricultural parcels failed to meet some of the GAEC standards.

Based on the results, it is clear that during the organization of future subsidy control campaigns (and also possible modifications of the legislation), the potentials of the remote sensing should be further taken into account.

Keywords: Control with Remote Sensing (CwRS), Good Agricultural and Environmental Conditions (GAEC), Computer-Aided Photo-Interpretation (CAPI), Geographical Information System (GIS)

Implementation and control of GAECs in Hungary (2004)

I. László,
B. Csonka, G. Csornai, L. Martinovich, G. Mikus, A. Kocsis,
L. Tikász, E. Bognár, Gy. Zelei, F. Tar, T. Pribela

Institute of Geodesy, Cartography and Remote Sensing (FÖMI)
Agricultural and Rural Development Agency
MARD – Dep. of Agri-environmental Management

Main legal basis of GAEC: Commission Regulation 2199/2003

12 issues, 4 of which is related to GAEC

(Good Agricultural and Environmental Conditions)

- Soil erosion
- Soil organic matter
- Protection of soil structure
- Minimum level of maintenace

National regulations should contain a subset of these issues.

These prescriptions are present in the National Rural Development Plan of Hungary (NRDP) and in the respective MARD decree.

Defining GAEC and GFP in line with the Commission Regulation 2199/2003

Strict rules, different control bodies, no data harmonisation

Legal harmonisation questions:

- Act 1994. LV. on agricultural land
- Act 1998. XXVII. on genetic technology
- Act 2000. XXXV. on plant protection
- MoA regulation 5/2001. (I.16.) on plant protection activities
- MoA regulation 8/2001. (I.26.) on the use, store, permission and trade of fertilisers
- Government decree 21/2001. (II.14.) on the protection of air
- Act 1996. LIII. on nature conservation
- MoE-MoA 2/2002. (I.23.) joint regulation on environmentally sensitive areas

Defining GAEC and GFP in line with the Commission Regulation 2199/2003

- Government decree 49/2001. (IV.3.) on the protection of waters against nitrate pollution from agricultural sources
- Government decree 33/2000. (III.17.) on the activities affecting the quality of groundwater
- Government decree 50/2001. (IV.3.) on the rules of application of sewage sludge
- Act 1998. XXVIII. on animal welfare
- MoA regulation 32/1999. (III.31.) on animal welfare rules of agricultural livestock
- Act 1997. LXXVIII on conversion and conservation of the built environment

14 national regulations, including 5 acts in the topic

Solution: no matter if national regulations are stricter then GAEC, if equal issues are controlled in national system, IACS takes the results, if not, a separate IACS physical control will be applied.

Main legal basis of GAEC in Hungary

MARD Decree 4/2004. (I. 13.)

Amended by MARD Decree 156/2004. (X. 27.)

GAEC: 4 issues, 16 standards
To be respected in case of SAPS + Top-up subsidies

Requirements of GAEC in area based payments in 2004

Issue	Standard	Check	Control
Soil erosion	•provide soil cover before spring crops •contour cultivation in erosion sensitive areas •retain terraces •do not cultivate row crops occurs on fields with slope higher than 12% •retain natural (green) erosion breaks, margins, hedges Check: the lack of the above		ARDA + FÖMI-RS – GIS (12% slope) External nat. bodies – field visit
Soil organic matter	•apply mechanical stubble management after harvest •stubble must not be burnt •crop rotation fitting to the local agro-ecological potential	•stubble management is lacking •visual signs of stubble burning •crops in the claims – last 5 years	ARDA + FÖMI-RS – 12% slope, IACS database admin. control, Plant and Soil Protection Office Network – MARD

Requirements of GAEC in area based payments in 2004

Issue	Standard	Check	Control
Protection of soil structure	• use appropriate machinery • apply periodical (once in 5 years) deep cultivation	Check: the lack of the above	ARDA External cross-reports – field visit
Minimum level of maintenance	• keep arable land in good agricultural condition, avoid weed infestation • retain and preserve landscape elements • retain permanent grasslands, no plough! • avoid the encroachment of scrubs • avoid over- or under grazing by utilising grasslands with appropriate livestock density • apply proper cutting regime with at least one cutting per year	Check: the lack of the above	ARDA + FÖMI-RS – weed and scrub encroachment is visible External cross-reports – field visit

Control of GAEC within CwRS of the area based subsidy claims in 2004

Issue	Standard
Min. level of maintenance	Keep **arable land** in good agricultural condition, avoid weed infestation
Min. level of maintenance	Avoid the encroachment of scrubs on **grasslands**
Soil erosion	Do not cultivate row crops on field with **slope** greater than 12%

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Problems and necessity of development in managing GFP in NRDP in the system of area based payments

Too complicated issues – difficult to manage and also to control

Posterior eligibility check of GAC in 30 Jun 2003 is impossible on the spot, we have to rely on the results of other controls

Should be integrated with IACS (cross-check)

RS control only for the SAPS+Top-up in 2004

CwRS of EAGGF area based claims of SAPS and national Top-up in 2004

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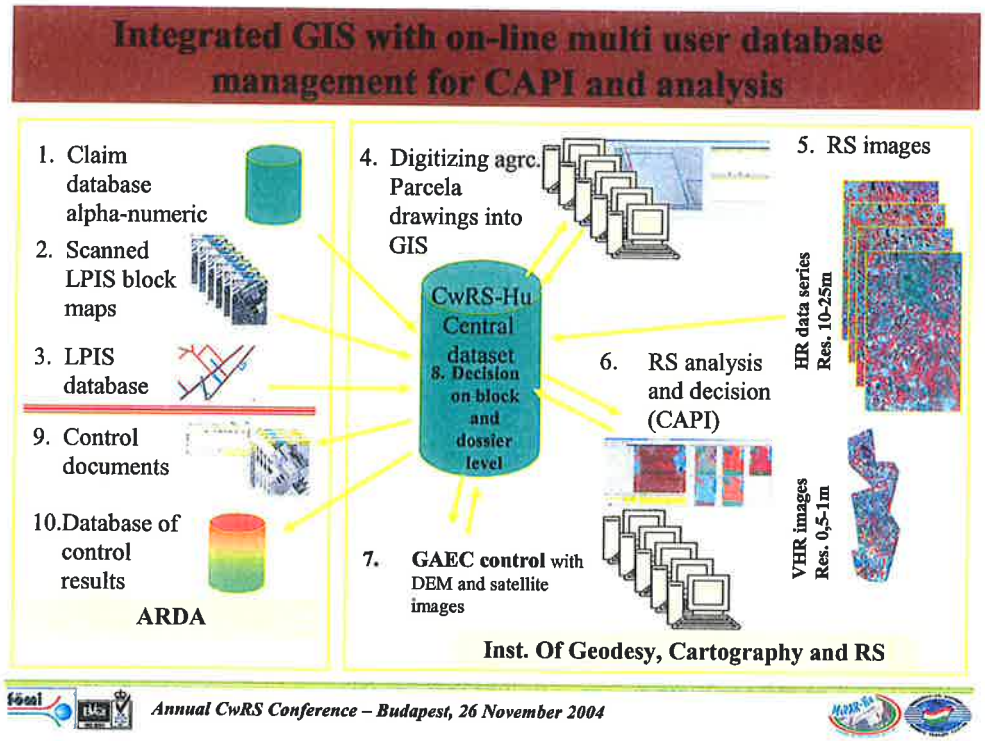
Integrated GIS with on-line multi user database management for CAPI and analysis
1. Claim database alpha-numeric
2. Scanned LPIS block maps
3. LPIS database
9. Control documents
10. Database of control results
ARDA
4. Digitizing agrc. Parcela drawings into GIS
CwRS-Hu Central dataset
8. Decision on block and dossier level
5. RS images
HR data series Res. 10-25m
6. RS analysis and decision (CAPI)
VHR images Res. 0,5-1m
7. GAEC control with DEM and satellite images
Inst. Of Geodesy, Cartography and RS
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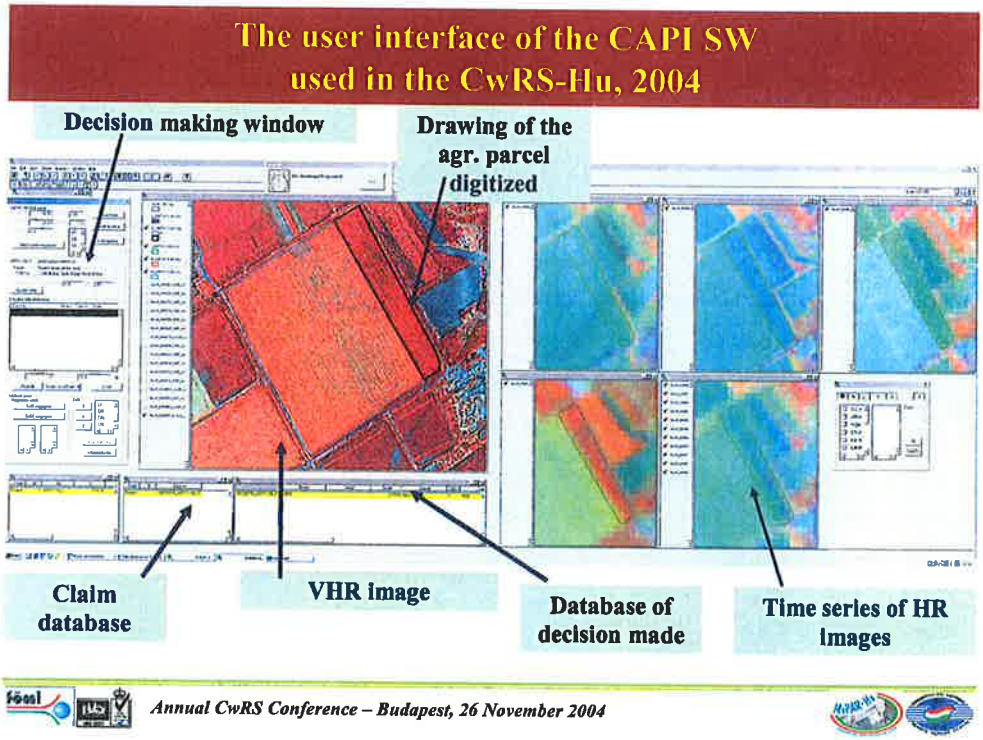
The user interface of the CAPI SW used in the CwRS-Hu, 2004
Decision making window
Drawing of the agr. parcel digitized
Claim database
VHR image
Database of decision made
Time series of HR images
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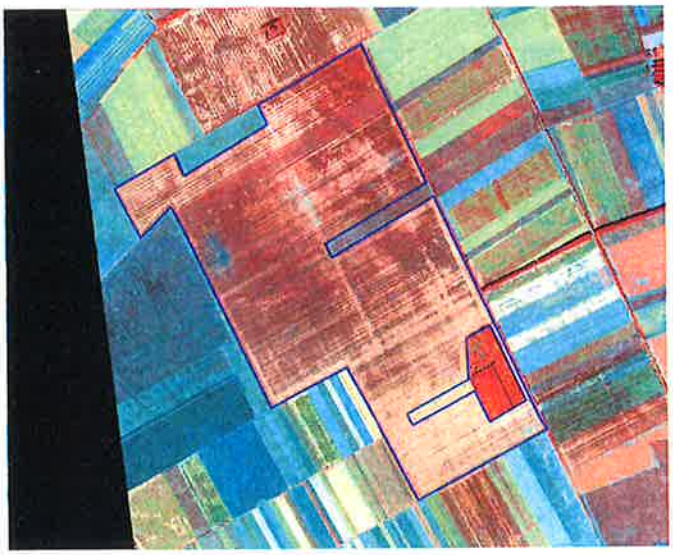
Control of GAEC within CwRS of the area based subsidy (SAPS + Top-up) claims in 2004

Issue	Standard	Code	Num. of cases
Min. level of maintenance	Keep **arable land** in good agricultural condition, avoid weed infestation	**GSZ** (CAPI)	553 (1.8%)
Min. level of maintenance	Avoid the encroachment of scrubs on **grasslands**	**GGY** (CAPI)	15 (<0.1%)
Soil erosion	Do not cultivate row crops on field with **slope** greater than 12%	**G12** (batch/ GIS)	11 (<0.1%)

Example: *passed* GSZ (arable) – winter wheat



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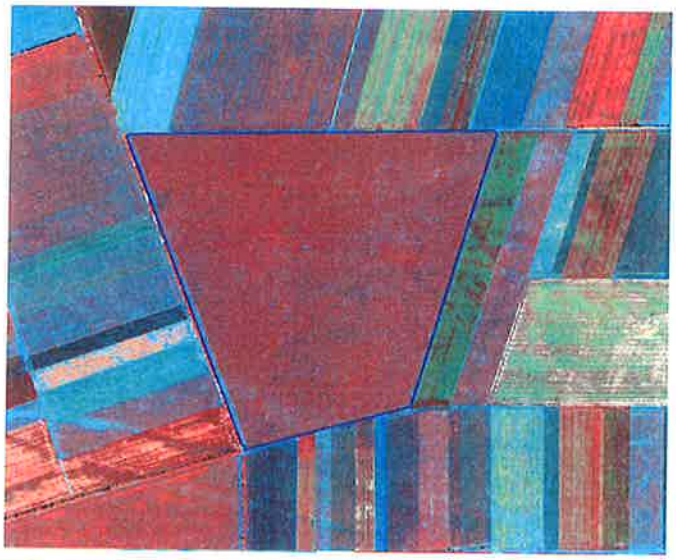
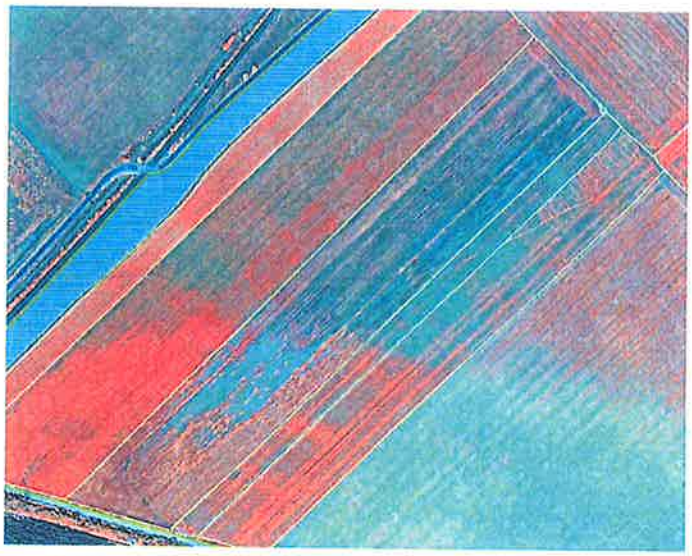
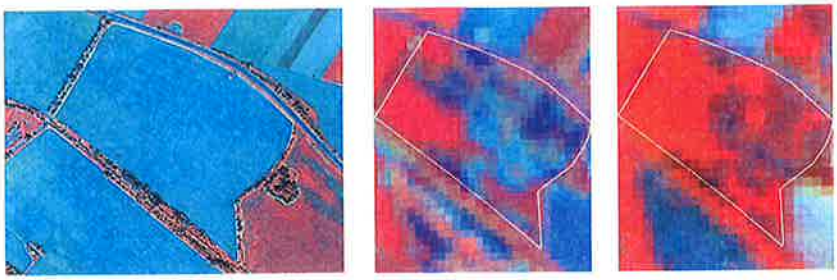
Example: *passed* GSZ (arable) – maize



Example: *failed* GSZ (arable) – triticale



Example: *failed* GSZ (arable) – maize

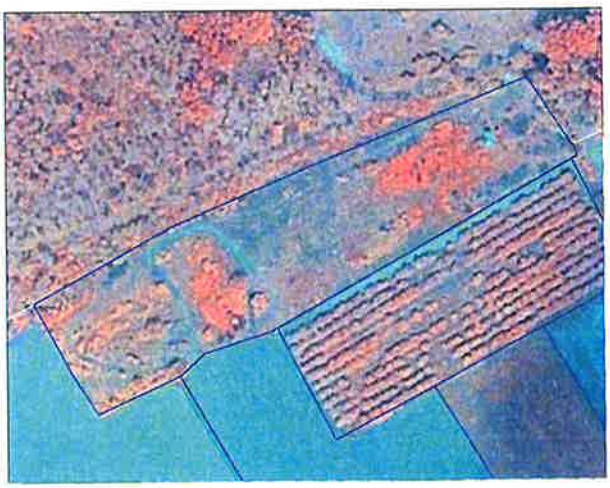


2004. 05. 29. VHR (IKONOS)

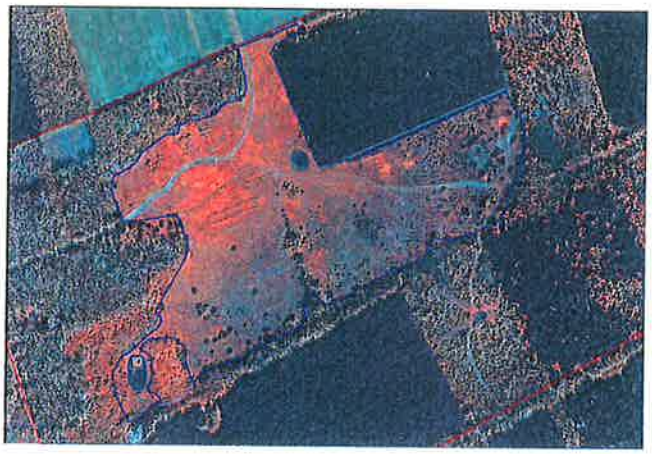
2004. 07. 20. SPOT 4

2004. 08. 21. Landsat TM

Example: *failed* GGY (grassland)



Example: *failed* GGY (grassland)



Checking G12: GIS

Digital Elevation Model (DEM)

Slope category map

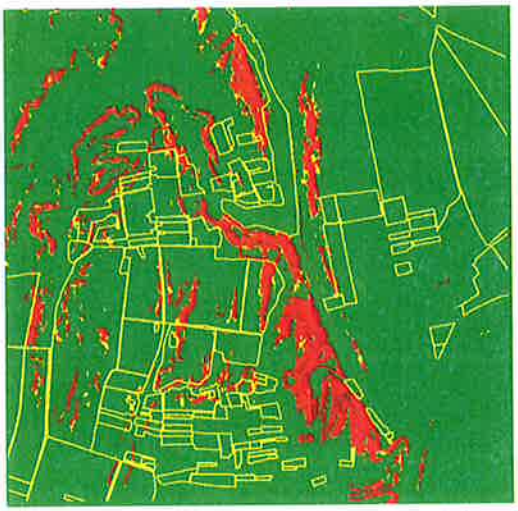
Polygons of measured parcels

Parcels with high elevation angle

Observed crop for measured parcels

Parcels with high elevation angle, cultivated with row crops **(G12)**

Checking G12: GIS



Checking G12: GIS

Thank You for the attention!

Presentation 3 – Definition of GAECs in France and possible control with RS

Fleur FRANCOIS-CHEMERY

ONIC-ONIOL, FR

Abstract

As a response to the four European issues, five standards were retained in France as Good Agricultural and Environmental Conditions (GAECs): Environmental cover, prohibition of the incineration of residues, shift of crops or winter soil management, irrigation, minimum level of maintenance. Some of them could be controlled with RS methods.

The French administration wants to control automatically with RS the area of environment cover, which must represent 3% of the total area and be located in priority along rivers. The presentation shows a demo of what the CAPI-software will have to do.

Keywords: cross-compliance, GAECs, CAPI, environmental cover

Definition of GAECs in France and possible control with remote sensing

1

Four European issues

- Soil erosion
- Soil organic matter
- Soil structure
- Minimum level of maintenance

2

Five standards in France

- Environmental cover
- Prohibition of the incineration of residues
- Rotation of crops or winter soil management
- Irrigation
- Minimum level of maintenance

3

Environmental cover

- 3% of the area
- Priority and compulsory localisation : land adjacent to river
- Level of maintenance :
  - pesticide and fertilization are forbidden
  - barren land is forbidden

4

Prohibition of the incineration of residues

- Principle : the incineration of residues is forbidden
- Exception : some individual or national dispensations could be given

5

Rotation of crops or winter soil management

- **Rotation of crops :**
  - Minimum of 3 different crops or 2 different families of crops
  - Each crop has to represent 5% of the total area
- **Winter soil management (exception) :**
  - Winter soil cover (crop in autumn or ground cover)
  - Good management of residues (mulching)

6

Irrigation

- Authorization of water pumping
- Water-meter

7

Minimum level of maintenance

- Distinction according to the types of crops

- application of good local agricultural practice
- weeds and waste lands are not allowed
- application of general rules relating to set-aside
- grazing or clearing of forage area

8

GAEC : Proposition of control organisation in France

- On the basis of 6% rate, 24200 area controls (IACS : first pillar)
  - 20700 by remote-sensing
  - 3500 field inspections
- 4000 GAEC controls
  about 3500 by remote-sensing
- GAEC controls are linked to area controls
- Each GAEC controlled by remote-sensing is completed by an actual field inspection. Remote-sensing is a helpful tool for the controller
- ONIC checks what is possible to control the day of the control. Some winter controls will be carried out.

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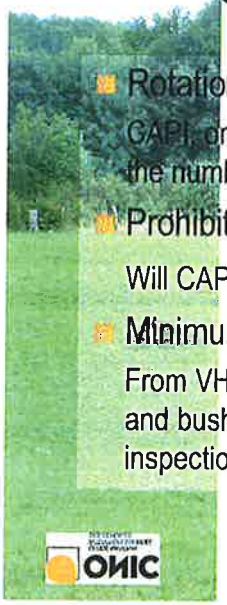
9

GAEC controlled with remote-sensing



- Rotation of crops
  CAPI, on the basis of application, counts the number of crops or the number of families of crops which represents more than 5%
- Prohibition of the incineration of residues
  Will CAPI be able to check this on summer 1 image ?
- Minimum level of maintenance
  From VHR or aerial photographs, CAPI will check the waste land and bushes. If present, it will be measured and checked by field inspection.

ONIC

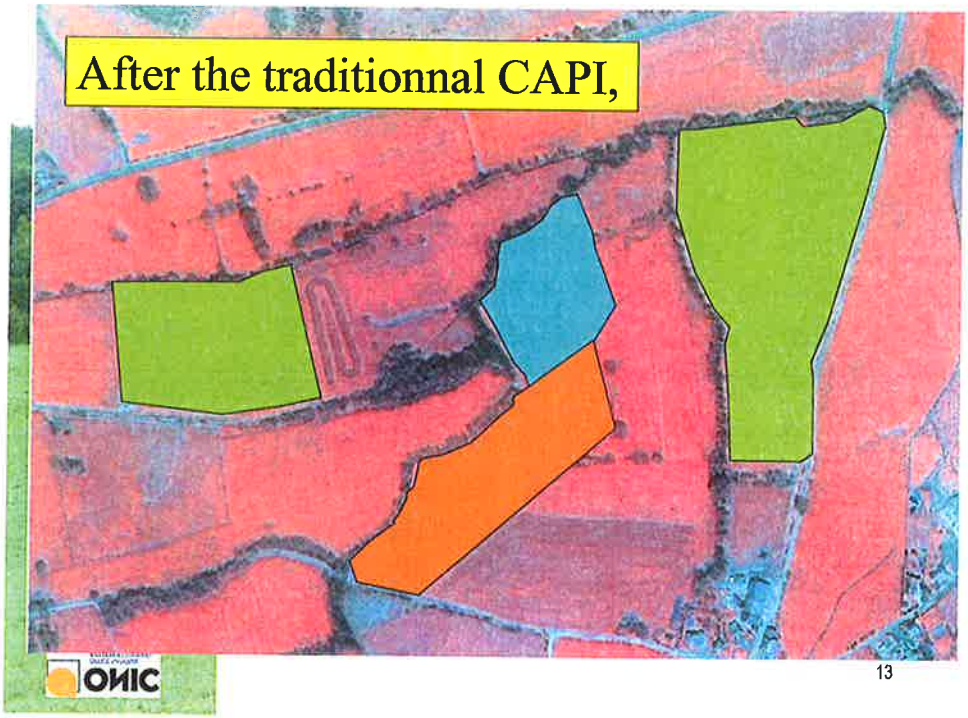
10

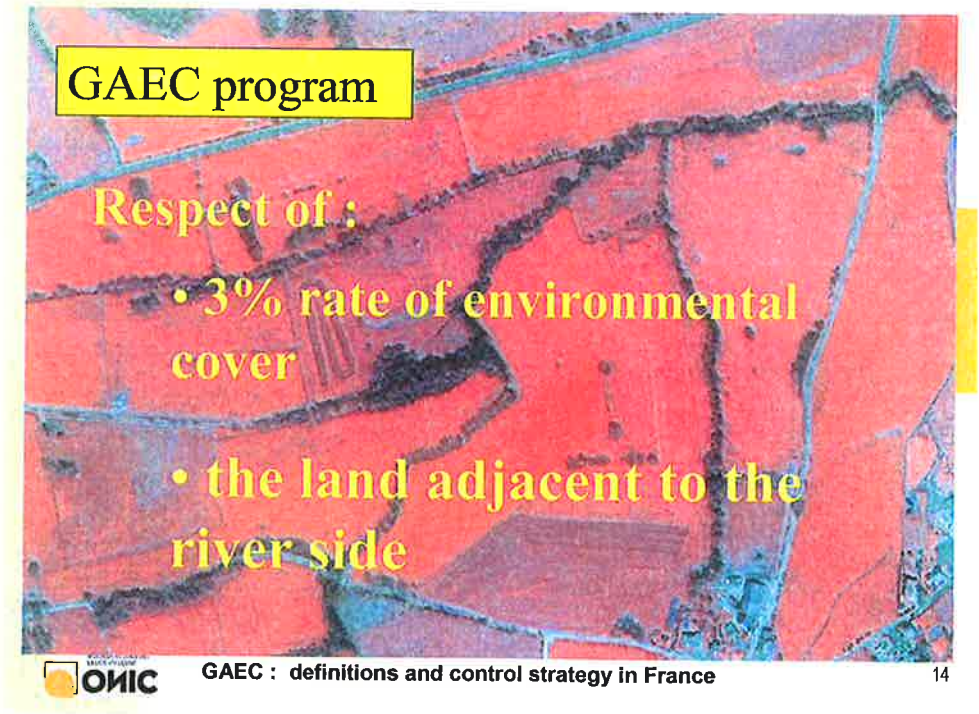
A first general trial

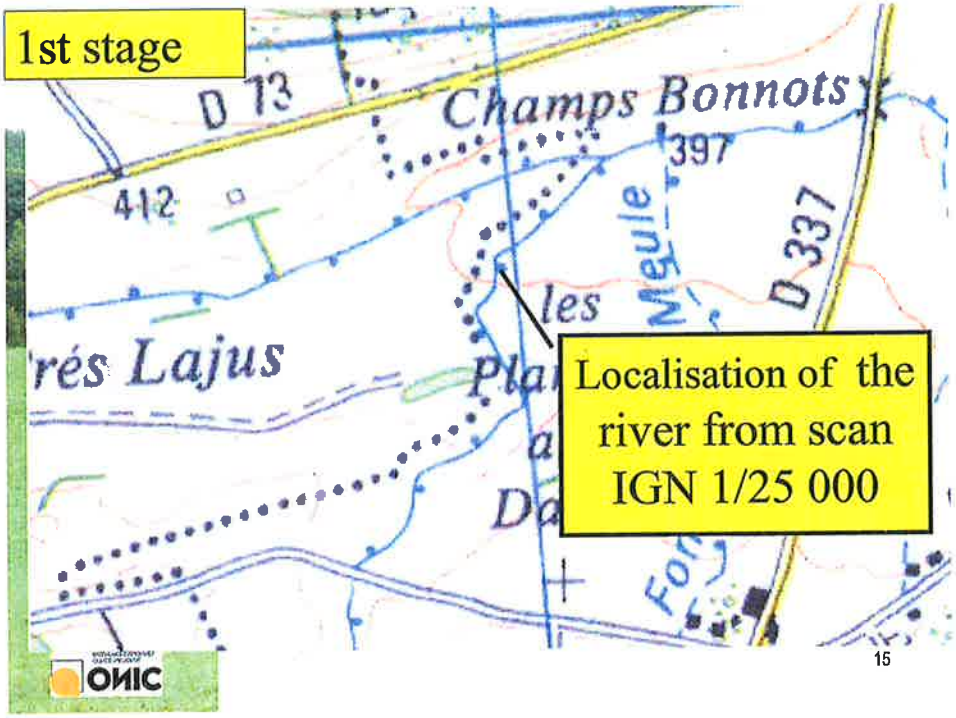
- GAECs' control on all the sites
  - 1% of all the applications -> little less than 1/5 of controlled applications
  - -Contractors – ONIC CAPI-teams
  - -In all cases a complementary field inspection by ONIC inspector
- End 2005 : report on what we have achieved (qualitative and quantitative)

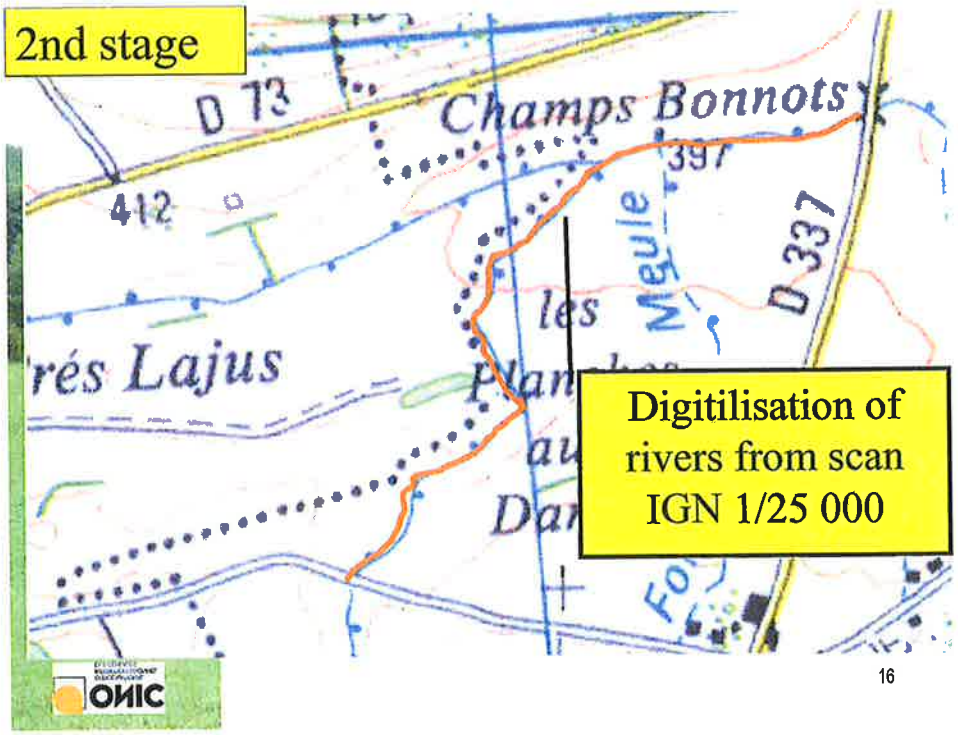
ONIC

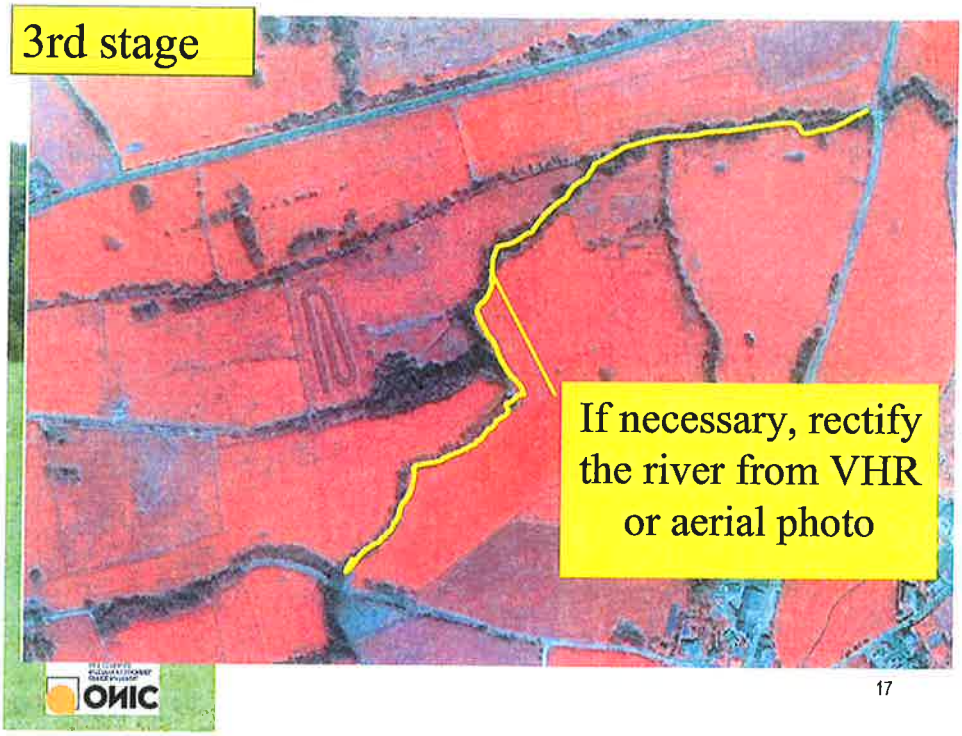
11

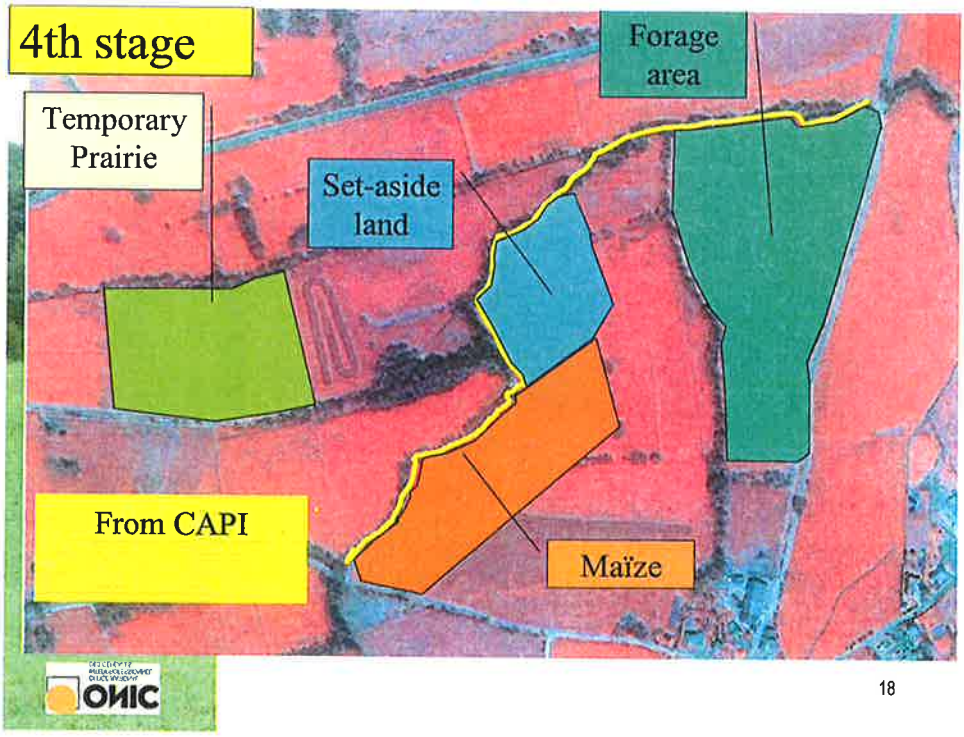

After the traditionnal CAPI,
ONIC
13

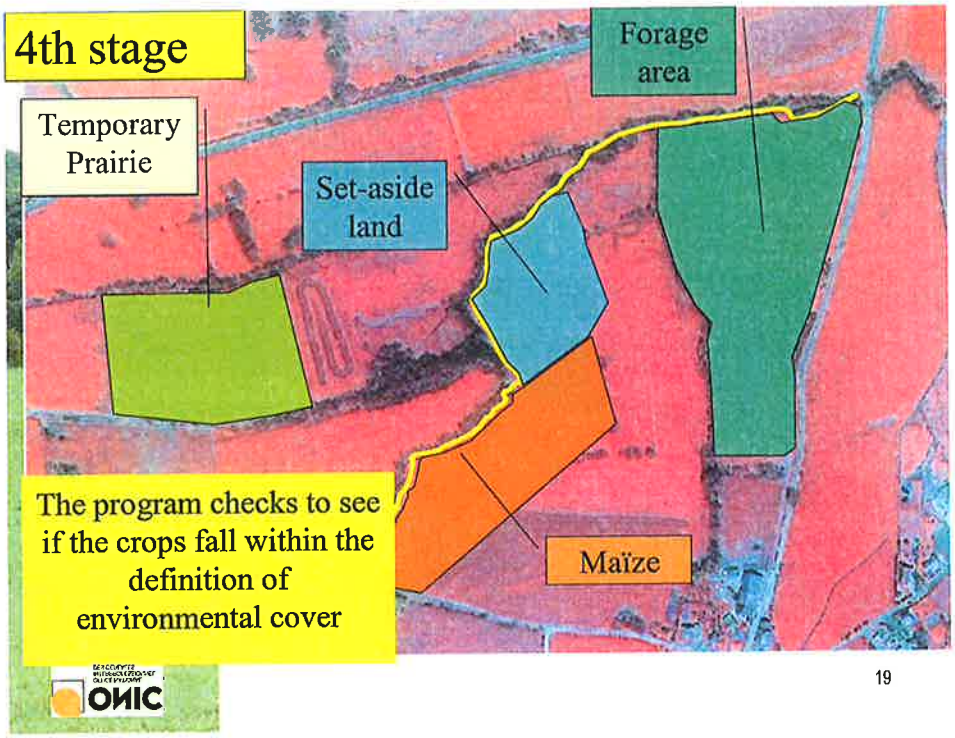

GAEC program
Respect of :
• 3% rate of environmental cover
• the land adjacent to the river side
ONIC
GAEC : definitions and control strategy in France
14

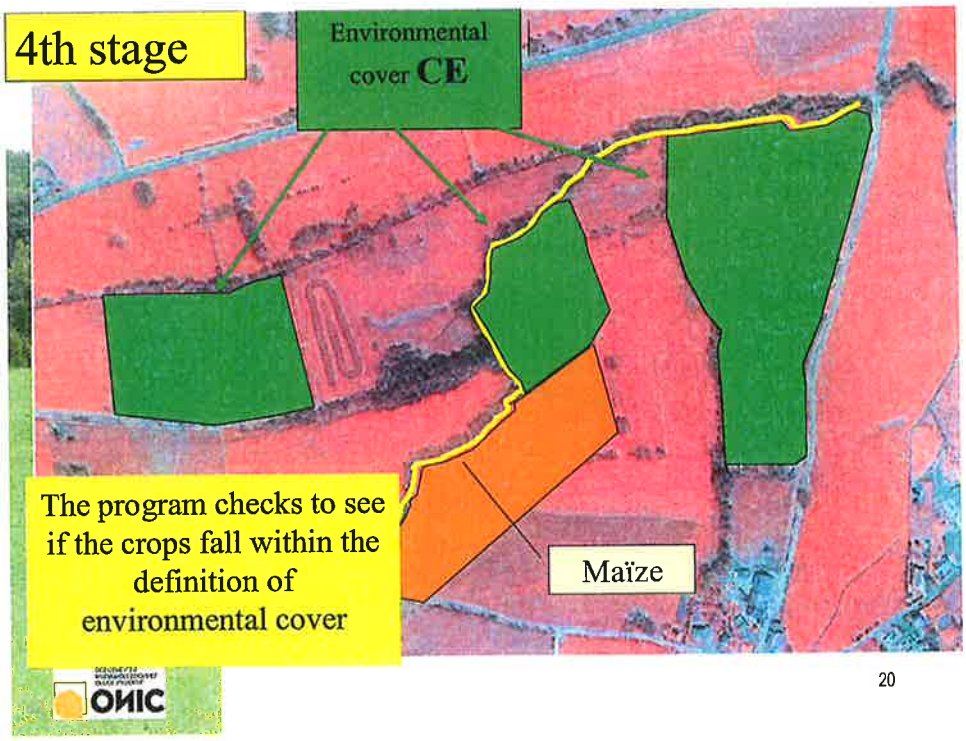

1st stage
D 73
Champs Bonnots
397
412
Meule
D 337
les
rés Lajus
Localisation of the river from scan IGN 1/25 000
ONIC
15

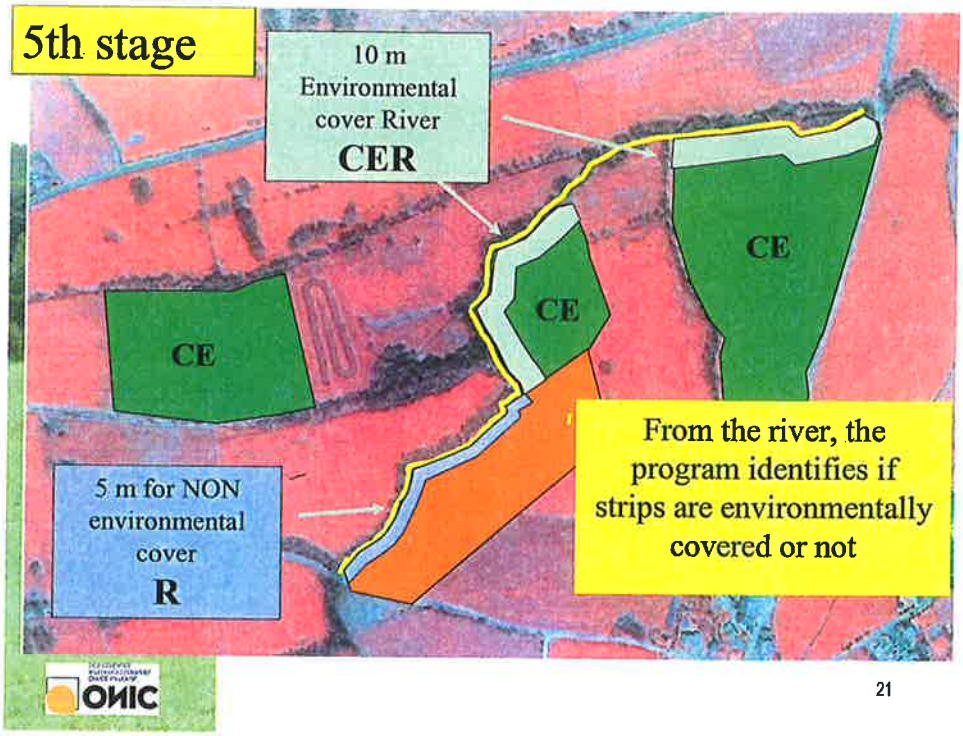

2nd stage
D 73
Champs Bonnots
397
412
Meule
D 337
les
rés Lajus
Digitilisation of rivers from scan IGN 1/25 000
ONIC
16

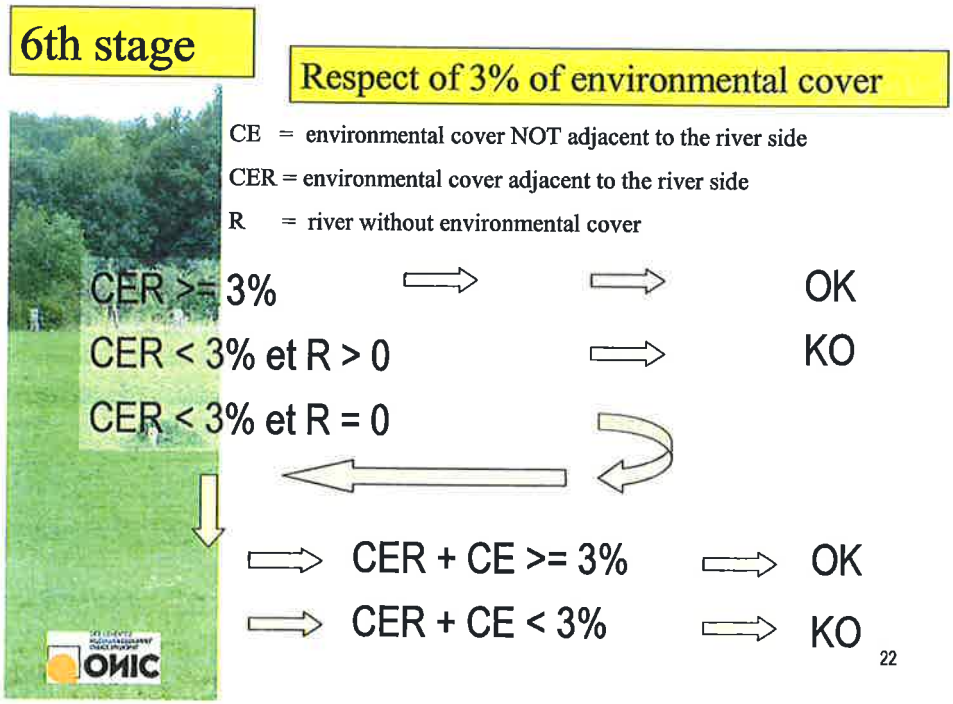

3rd stage
If necessary, rectify the river from VHR or aerial photo
ONIC
17


4th stage
Forage area
Temporary Prairie
Set-aside land
From CAPI
Maïze
ONIC
18


4th stage
Forage area
Temporary Prairie
Set-aside land
The program checks to see if the crops fall within the definition of environmental cover
Maïze
ONIC
19


4th stage
Environmental cover CE
The program checks to see if the crops fall within the definition of environmental cover
Maïze
ONIC
20


5th stage
10 m Environmental cover River CER
CE
CE
CE
5 m for NON environmental cover R
From the river, the program identifies if strips are environmentally covered or not
ONIC
21


6th stage
Respect of 3% of environmental cover
CE = environmental cover NOT adjacent to the river side
CER = environmental cover adjacent to the river side
R = river without environmental cover
CER >= 3% ⇒ ⇒ OK
CER < 3% et R > 0 ⇒ KO
CER < 3% et R = 0
⇒ CER + CE >= 3% ⇒ OK
⇒ CER + CE < 3% ⇒ KO
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22

GAEC controlled by field inspection

- Irrigation
- Prohibition of the incineration of residues
- Maintenance : weeds, pasture...
- Winter soil management (control will be carried out in winter 2005/2006)

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Presentation 4 – Cross-compliance Control of GAEC in the Czech Republic, 2004 CwRS campaign

Lucie Savelkova

SZIF, CZ

Abstract

The presentation describes the control of GAEC with the help of Remote Sensing in the Czech Republic, 2004 campaign. The presentation highlights the important steps of the decision making of GAECs establishment, and implementation process of GAECs´ control. In addition to that the presentations also propose same future visions of GIS, as a strong support tool for risk analysis, and decision making about cross-compliance issues.

Keywords: important terminology, Cross-compliance, GAECs, CwRS, GIS/LPIS, Policy making/policy implementation, Feasibility, Future visions of GIS

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Cross-compliance

Control of GAEC in the Czech Republic - 2004 campaign

BUDAPEST, 24-26/11/04

Lucie Savelkova

Department of System Support

10th CwRS conference
Budapest
24 - 26/11/04

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Státní zemědělský intervenční fond

SAPS – 1st year of administration

AGENDA OF PRESENTATION

- **Basic information of SAPS administration**
- **GAECs establishment**
- **Other national rules related to cross-compliance**
- **Control with Remote Sensing related to GAEC**
- **CwRS – results related**
- **Key factors of controls of Cross-compliance**
- **Future vision of control of Cross-compliance**
- **Conclusion**

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SAPS – 1st year of administration

BASIC INFORMATION ABOUT IACS ADMINISTRATION

- State Agricultural Intervention Fund – 7 regional offices
- Single Area Payment Scheme - SAPS (15th May)
- Applications received - 18 871
- Minimal rate of controls - 7 %
- Cumulative controls (1st and 2nd scheme together)
- Control with Remote Sensing - 64 %
- CwRS – control sites - 3 (1 VHR, 2 HR sites)
- CwRS – results, dossier accepted - 40 %
- Rapid field visits - 3.7 %
- CwRS control finished on - 15/10/04

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GAEC establishment

MAIN OBJECTIVE OF GAECs ESTABLISHMENT

- The simplification of GAECs administration

  (for the 1st scheme year GAECs were not seen as the most important elements of IACS administration)

- Selection of the most important GAEC

- Reduce the potential of *Soil erosion*

  - 50 % of arable land is endangered by water erosion
  - 10 % of arable land is endangered by wind erosion

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GAEC establishment

GAEC was established by the Ministry of Agriculture with the help of research institutions

Ministry of Agriculture (MoA)

Research Institutes (RISWC, RICP, etc.)

European bodies (DG-Agri, etc.)

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Cross-compliance, SAPS - GAEC

Regulatory Basis for SAPS – Czech Republic

- **SAPS – ES No. 2199/2003 and National Regulation No. 243/2004**

GAEC for SAPS – 1st pillar scheme, GAEC means

„Good agriculture and environmental condition is meant *PRESERVATION* of landscape and other *FEATURES* helping to avoid soil erosion by wind and water

(field balks, retain terraces, valley lines, windbreak strips, and contour field paths with drains)".

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SAPS – Other National Regulation

Other National Regulation – addition to GAEC

National Regulation No. 252/1997
- related both to 1st as well as 2nd pillar schemes
SAPS - 1st pillar
HRDP - 2nd pillar

- states that „*CONVERSION* of grass-land into arable land is generally *FORBIDDEN*, in order to maintain the biodiversity of agriculture land and with the aim to maintain the level of grass-land in the Czech Republic".

Not established as GAEC but related to cross-compliance and is checked by On-the-spot-controls

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SAPS - Control of GAEC

ESTABLISHMENT OF GAEC – RELATED PROBLEMS

- **The GAEC was established by the *Ministry of Agriculture* without taking into account if:**
  - **that GAEC is in practice controllable**
  - **that GAEC is precisely defined**
  - **that GAEC will affect any farmers or land**
  - **how the not-fulfillment will be penalized**
  - **regional differences**

- **SERIOUS PROBLEMS FOR THE CONTROL BODY**
  - **Paying Agency (SZIF)**

The Paying Agency should have been included in the process of GAEC establishment.

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SAPS - Control of GAEC

PROBLEMS RELATED TO CONTROL OF the GAEC

SZIF (control body) has to establish more detailed rules to be able to control the GAEC

It must be stated what will serve as the *reference database* for the GAEC control.
- LPIS

It must be defined whether control with *Remote Sensing* will be used to control that GAEC.
- yes

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LPIS – cross-compliance information

LPIS – GIS, contains information related to cross- compliance

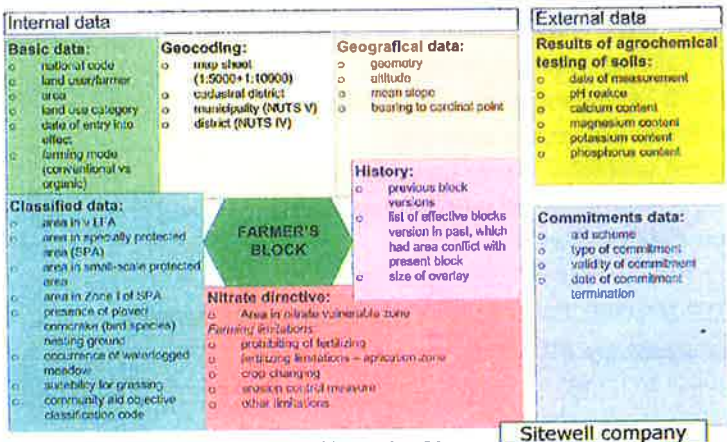

Diagram 1: Farmer's block data registered in Czech LPIS

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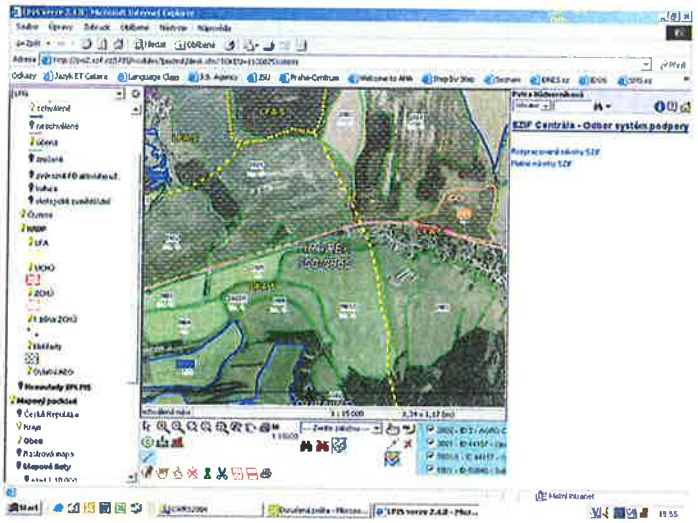
LPIS – example of information



Different layers

DATA ENTRY
Ministry of Agriculture
Ministry of Environment
SZIF
Cadastral Institution
Route map

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GAEC – Control with Remote Sensing

CwRS on the farmer's block controls:

- Size
- Land cover
- GAEC and UGFPs (if possible by CwRS)

National contractor – GISAT company

3 sites for CwRS campaign were selected

–based on Risk Analysis, 30km x 30km grid

1. Vrchlabí site (square 30*30 km) – VHR site
   „mountainous area, small farms, pastureland, LFA "
2. Tachov site (circle 25 km) – HR site
   „ bigger farms, grass and pastureland, forests, LFA"
3. Hodonín site (circle 25 km) – HR site
   „flat area, big farms, arable land and vineyards

DIFFERENT CONDITIONS – SAME GAEC

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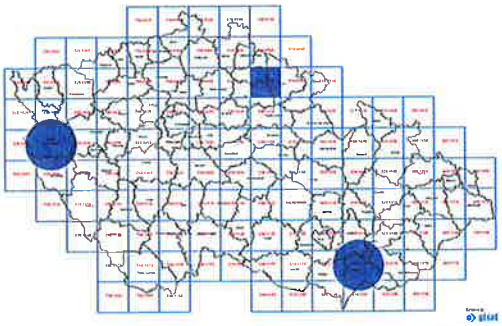
SAPS – Control with Remote Sensing

Sites selected for CwRS



Images:
HODO:
- SPOT 4 XI
- SPOT 2 XS
- RADARSAT Fine

TACH:
- SPOT 5 XI
- SPOT 4 XI
- RADARSAT Fine

VRCH:
- IKONOS
- EROS
- LANDSAT 5
- SPOT 2 XS
- RADARSAT Fine

	HODO	TACH	VRCH	TOTAL
Applicants checked by CwRS	351	192	293	836 (1171)
Number of farmer's blocks checked	7 229	4 387	6 519	18 135

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SAPS – Control with Remote Sensing - Results

CwRS results for checked dossiers

APPLICATIONS checked by CwRS	From which					
	Accepted by CwRS		Rejected by CwRS		CwRS not applied	
	abs.	rel.	abs.	rel.	abs.	rel.
1171	469	40,1%	686	58,6%	16	1,4%

Rapid field visits **carried out for 3.7 % of checked farmer's blocks**
Quality control **of CwRS carried out for 2 % of the accepted dossiers**

MAIN SIGNIFICANT FINDINGS from CwRS:
- **C3 codes (no always sanction but LPIS problem)**
- **G2 code (plough of grass-land, forbidden in the Czech Republic)**
- ***NO findings related to not fulfillment of GAEC requirement***

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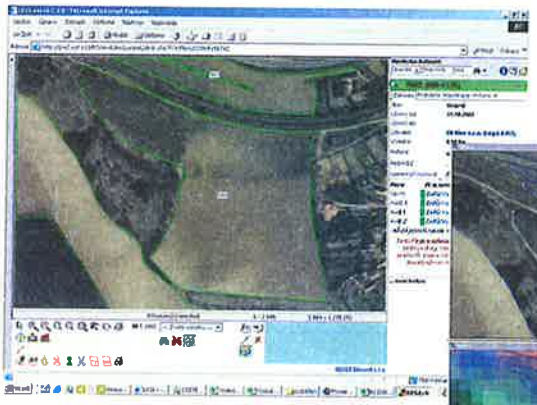
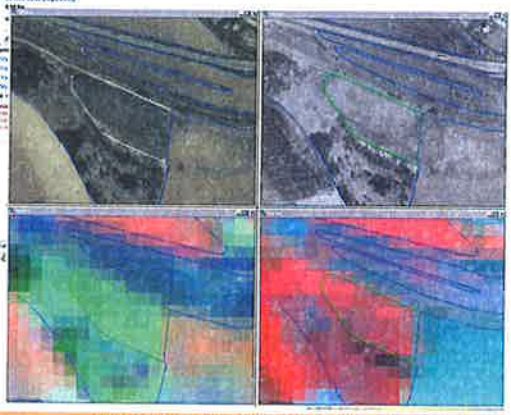
Example of CwRS – C3 code



In the LPIS
1 farmer's block
Declared as arable land
6.38 hectares



CwRS pointed out
- Arable land
- Grass-land

Should be 2 farmer's blocks

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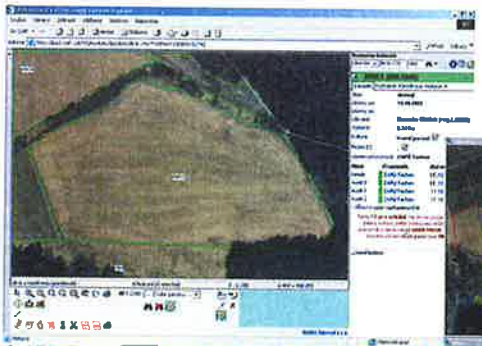
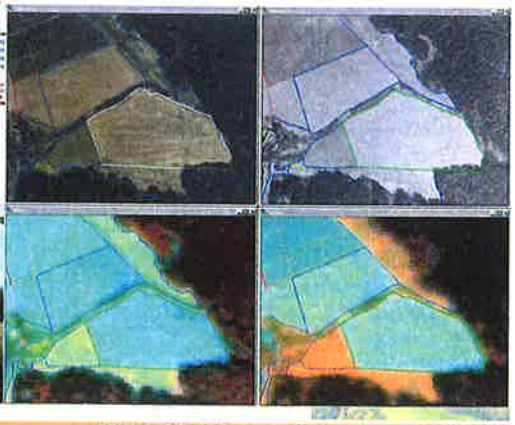
Example of CwRS – G2 code, plough of grass-land



In the LPIS
Declared as grass-land
6.34 hectares



CwRS and RFV shows Plough of grass-land

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Example of soil erosion

Soil water erosion
SOIL PROBLEM

No problem identified by CwRS Because no GAEC not-fulfillment found

GAEC definition **„....preservation of features..."**
No mentioned other factors such as way of plough on slope fields, Broad-row crops, etc.

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MAIN CONCLUSIONS FROM CwRS RESULTS

MAIN CONCLUSIONS FROM CwRS RESULTS

- ***NO finding related to not-fulfillment the GAEC***
- **The main objective of GAEC (prevention of soil erosion) was not met because of the wrong definition of GAEC**
- **The control body had problems relating to control of the GAEC**
- **The potential of LPIS was not fully used**
- **The erosion problems was not solved**

The policy making was far away from policy implementation.

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GAECs establishment in THE YEAR 2005

GAECs establishment in the year 2005

Ministry of Agriculture (MoA)

Policy making hand by hand with Policy implementation

Research Institutes (RISWC, RICP, etc.)

European bodies (DG-Agri, etc.)

Paying Agency (SZIF)

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GAECs in the year 2005 – establishment, administration

GAECs in 2005, establishment, administration in the Czech Republic

- **Use the potential of LPIS data for analysis**
  - **risk analysis**
  - **feasibility**
  - **regional differences**
  - **administrative burden ANALYSIS**
- **Include regional differences**
- **Improve LPIS quality**
- **Exploit the possibilities of Remote Sensing**

Re-establishment of current GAEC

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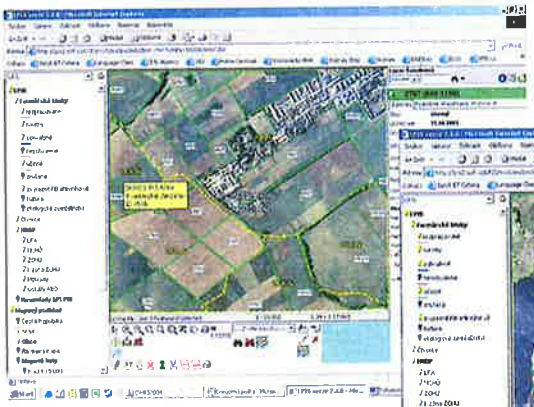
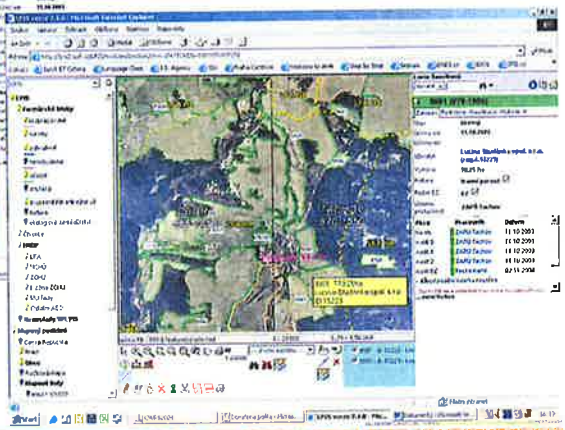
Example of analysis based on LPIS data



Regional differences
- Different agricultural conditions



GAECs should fit to the target group

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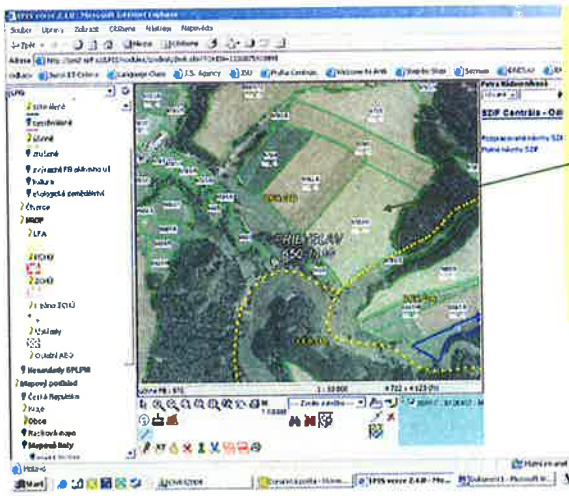
Example of analysis based on LPIS data



Analysis of sloppy fields:

- Prediction of how many farmers will be affected by the GAEC

- Followed up by cost effectiveness analysis

The GAEC should fit to the target group

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Cross-compliance – GAECs – CwRS - CONCLUSION

CONCLUSION – YEAR 2005

- **Control with Remote Sensing could be effectively used to control some GAECs**
  - using VHR satellite data imagery
  - using digital aerial fotogrammetry
  - appropriate risk analysis
- **Need to establish conditions and evaluation of effectiveness of using these methods for control of GAECs**
- **Need to define conditions, means and tools of data gathering, data processing, and result-data transmission**

CwRS has a big potential in cross-compliance problematic

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CONCLUSION – year 2005

CONCLUSION – YEAR 2005

- Single Area Payment Scheme (SAPS)
- **Applications expected – 21,000**
- Minimal rate of controls – 7%
- **Cumulative controls, SAPS + HRDP together (1st and 2nd pillar schemes)**
- **Re-definition of GAEC**
- **Focus on LPIS data quality**
- CwRS – 4 sites, VHR if possible
- **CwRS – control of GAECs**
- CwRS – 30% of OTS checks

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Thank you for your attention

Session 5 – IACS GIS and Remote Sensing

Chairman:

Lucie Savelkova,
SZIF, CZ

Co-chairman:

Simon Kay,
JRC, IPSC, Agrifish Unit

Presentation 1 – An independent evaluation of the SPOT Image Référénce3D digital elevation model and orthoimage products

Simon KAY,
JRC, IPSC, Agrifish Unit

Abstract

The widespread availability of good quality digital elevation data opens the door to systematic and improved automation of orthoimage production, in the context of the IACS and the control with remote sensing activity. Best practice for production of VHR (<1m pixel imagery) meeting IACS requirements usually states a quality of 5m $RMSE_z$ is required.

During 2004, two sources have emerged: the "opensource" SRTM C-band (3 arc-sec, approx. 90m grid size) data, released to the general public via the internet and requiring careful processing, and SPOT Image's commercial Référénce3D product, which is created using the stereo HRS sensor on the SPOT5 platform. Both data sources have official general specifications somewhat lower than the 5m $RMSE_z$, but given the usually limited relief in agricultural areas, an investigation into the quality of these datasets was considered an important task.

This presentation will report on the test carried out by the JRC and FÖMI to determine the suitability of the SPOT Image Référénce3D product covering a single production tile (approx 10,000km2) in Hungary. The quality assessment methodology was developed at the JRC, and executed using comparison data available in Hungary by FÖMI. The results show that the Référénce3D for the tile tested performed better than its standard specification, and is suitable for rectification of most VHR imagery in the context of IACS without further processing, besides projection and datum transformations.

Keywords: DEM, elevation, datum transformation, Référénce3D

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Joint Research Centre

An independent evaluation of the SPOT Image / IGN Reference3D digital elevation model and HRS orthoimage products

Simon Kay, Rafał Zieliński, Peter Spruyt
Joint Research Centre - Ispra
Szabolcs Mihály, Peter Winkler, Gyula Ivan
Institute of Geodesy, Cartography and Remote Sensing – FÖMI, Budapest

Budapest, Hungary

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DIRECTORATE-GENERAL
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Test objective

- Widespread availability of good quality digital elevation models (DEMs) permits systematic and improved automation of orthoimage production.
  - Best practice for production of VHR (<1m pixel imagery) meeting IACS requirements implies a quality of 5m $RMSE_z$ is required.
- Two current options:
  - Reference3D (commercial), 1 arc sec posting
  - SRTM (open source), 3 arc sec posting
- An independent evaluation of the SPOT Image Reference3D digital elevation model and HRS orthoimage products would provide
  - A statement concerning their possible use in the CwRS/IACS programme
- Agreement made to test a production tile in Hungary, in collaboration with FÖMI

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The SPOT5 HRS instrument

- Points fore and aft of the satellite
  - able to acquire stereopair images - almost simultaneously - in a single pass.
  - No oblique viewing capability
- Observes a swath of 120 kilometres
  - centred on the satellite ground track,
  - with a repeat cycle of 26 days.

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The dataset under test

- Reference3D digital elevation model
  - Geographic coordinates, ellipsoid WGS84, vertical datum EGM96
  - 1 arcsec graticule:
    - approx. 20mx28m cell size @ 45° Lat. (variable posting)
  - $RMSE_Z$ approx. 6 to 7m stated in "typical case"

Absolute elevation accuracy linear error with respect to EGM96 (confidence level 90%)	
flat or rolling terrain (slope ≤ 20 %)	10 m
hilly terrain (20 % < slope ≤ 40 %)	18 m
mountainous terrain (slope > 40 %)	30 m

- The HRS ortho-rectified image
  - Pixel size 1/6th arcsec (approx 5m x 3m pixel size)
  - Stated geometric accuracy circular error 16m (90 %)
    - i.e., around 10m $RMSE_{2D}$

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The test site

- South of Budapest, covering moderate relief, agriculture and forest land use.
  - Maximum altitude of the tile = 678m,
  - min = 76m,
  - Roughness (SD) = 149m
- Geographic location
  - 18°E to 19°E
  - 46°N to 47°N

Quality Control Reference3D DEM Slide 5

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Test methodology 1: HRS Orthoimage

- Basic approach: JRC orthoimage QC guidelines
  - Set of 200 (2D) points derived from the MADOP ortho-rectified imagery
  - Measured image to image
- Analysis of the discrepancies between the MADOP and Reference3D data

MADOP orthophoto QC results

Phase	Quantity of sheets	Check points	Blunder	Accept	mx (m)	my (m)
I.	99	1740	31	1709	0.65	0.60
II.	100	1737	21	1716	0.65	0.70
III.	60	1131	7	1124	0.58	0.55

Quality Control Reference3D DEM Slide 6

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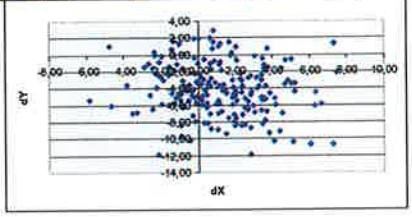
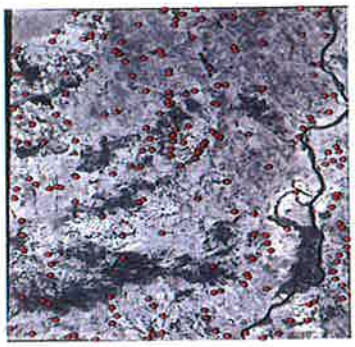
Results, HRS orthoimage geometry

- Pixel level RMSE – good result
  - Shift in N-S direction (along track)

MeanEast	Mean North	RMSE East	RMSE North
1,15	-4,10	2,64	5,09





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Test methodology 2: Reference3D DEM against independent points

- Comparison against a set of ~ 5000 independent points
  - Derived from (up to) 4th order survey network
  - 135 points were detected as blunders (points on high buildings or pylons) and deleted from the control set
- Trig-point used for a general quality assessment of
  - The MADOP digital elevation model
  - The Reference3D dataset using the complete image and using a first stratification (only land-classes)

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Note: vertical datums, measuring heights

- Hungarian data (HD72 related surface) and Reference3D (EGM96) are both **mean sea level** (geoid)
  - but a slight separation was identified

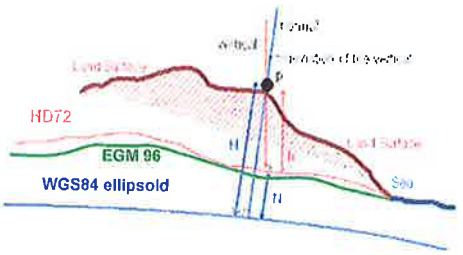

Figure adapted from OSI

- How big is the EGM96-HD72 "related surface" separation?
  - Empirical test on 367 points: mean separation is 1.5m
  - Data adjusted with shift in vertical direction
    - constant over test area

Quality Control Reference3D DEM Slide 9

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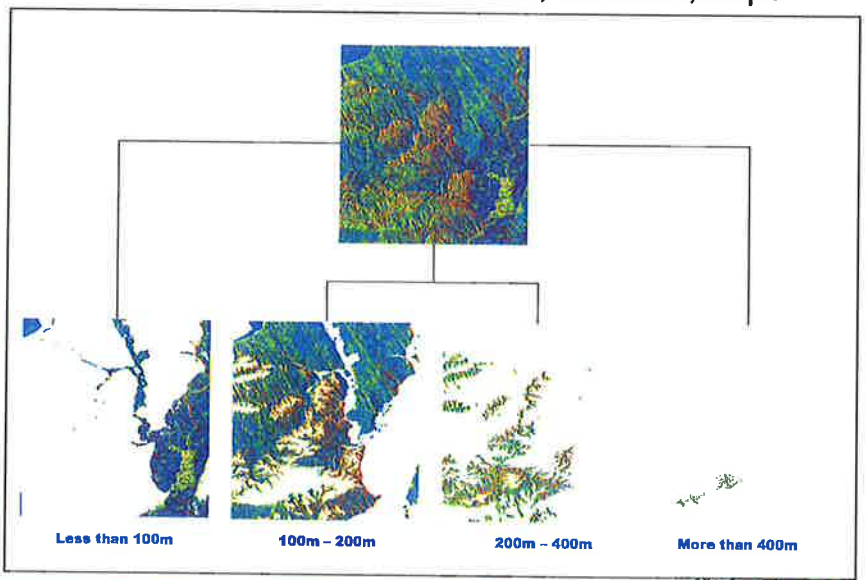
- GIS masks for land cover classes, elevation, slope



Quality Control Reference3D DEM Slide 10

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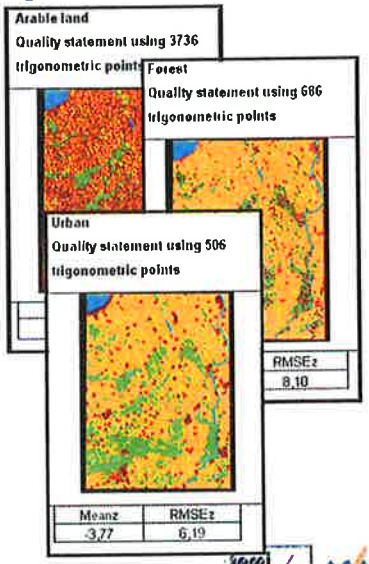
Result: Reference3D against ~5000 independent points

- Global result:
  - $Mean_Z$ = 0,28m
    $RMSE_Z$ = 5,39m
- With a 3 land-class stratification:
  - Agricultural 4.61m
  - Forest 8.10m
  - Urban 6.19m



Quality Control Reference3D DEM Slide 11

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Test methodology 3: Reference3D DEM against MADOP DEM

- Pixel to pixel comparison between MADOP DEM and the Reference3D DEM
  - Over 12 million pixels in Reference3D dataset
  - MADOP DEM 5mx5m cell, in Hungarian projection
- Result: "Difference DEM" made with the same data structure as Reference3D
- Software environment:
  - Conversions and geodetic datum transformation: ESRI ArcGIS 8.3, use of official geodetic parameters
  - MADOP height (bilinear) interpolation and comparison of height data: FÖMI-developed software

Quality Control Reference3D DEM Slide 12

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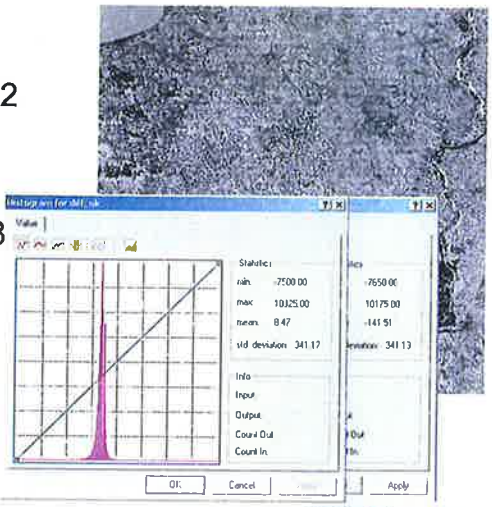
Result: Reference3D vs. MADOP DEM

- Global results:
  - Mean value = -1.42
  - $RMSE_Z$ = 3.41m
  - Mean value = 0.08
  - $RMSE_Z$ = 3.41m



Quality Control Reference3D DEM Slide 13

fömi MARS

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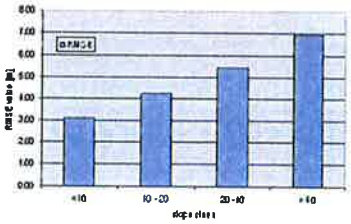
Results: slope classes

slope less then 10 % | slope 10-20% | slope 20 and 40 % | slope 40 and more%

slope	rmse (m)	number of pix	%
<10	3.11	10841580	83.63%
10 - 20	4.22	1470426	11.34%
20 -40	5.43	623805	4.81%
> 40	6.91	27789	0.21%
		12963600	

Slope - RMSE



Quality Control Reference3D DEM Slide 14

fömi MARS

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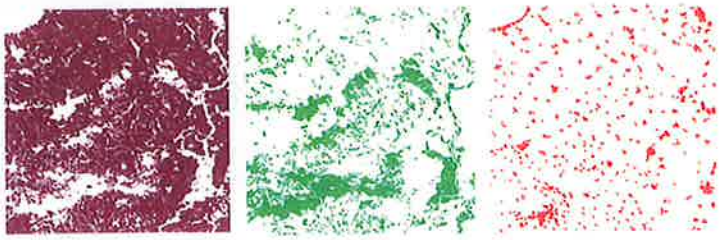
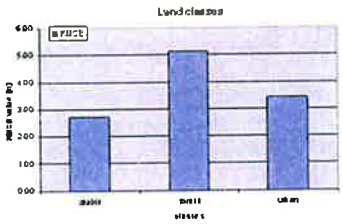
- Results: land classes

Arable | Forest | Urban





land classes	rmse (m)	number of pix	%
arable	2.71	9390712	74.71%
forest	5.12	2563737	20.40%
urban	3.40	614449	4.89%
		12568898	

Quality Control Reference3D DEM Slide 15

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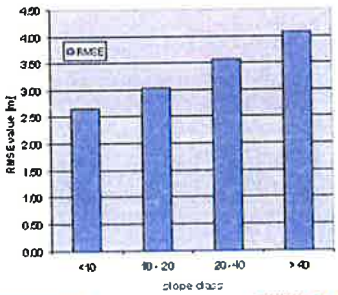
- Results: Agriculture combined with slope

Agriculture with slope less then 10 % | Agriculture with slope between 10 and 20 % | Agriculture with slope between 20 and 40 % | Agriculture with slope between 40 %



slope	rmse (m)	number of pix	%
<10	2.65	8462994	90.12%
10 - 20	3.03	759905	8.09%
20 -40	3.57	165457	1.76%
> 40	4.07	2724	0.03%
sum		9391080	

Quality Control Reference3D DEM Slide 16

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- Results: Forest combined with slope

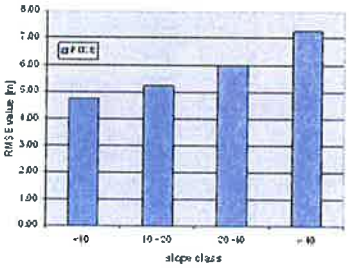
Forest with slope less then 10 %

Forest with slope between 10 and 20 %

Forest with slope between 20 and 40 %

Forest with slope between 40 %

slope	rmse (m)	number of pix	%
<10	4.74	1433913	55.91%
10 - 20	5.23	660224	25.74%
20 -40	5.98	446315	17.40%
> 40	7.28	24037	0.94%
sum		2564489	



Quality Control Reference3D DEM Slide 17

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Results: Urban combined with slope

Urban with slope less then 10 %

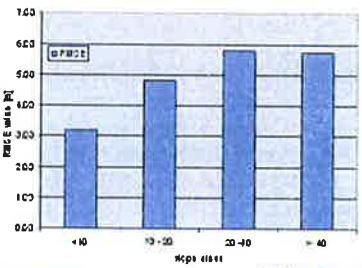
Urban with slope between 10 and 20 %

Urban with slope between 20 and 40 %

Urban with slope between 40 %

Not significant

slope	rmse (m)	number of pix	%
<10	3.22	558595	91.02%
10 - 20	4.81	45642	7.44%
20 -40	5.78	9268	1.51%
> 40	5.72	223	0.04%
		613728	



Quality Control Reference3D DEM Slide 18

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Key result summary: Land cover type, by slope

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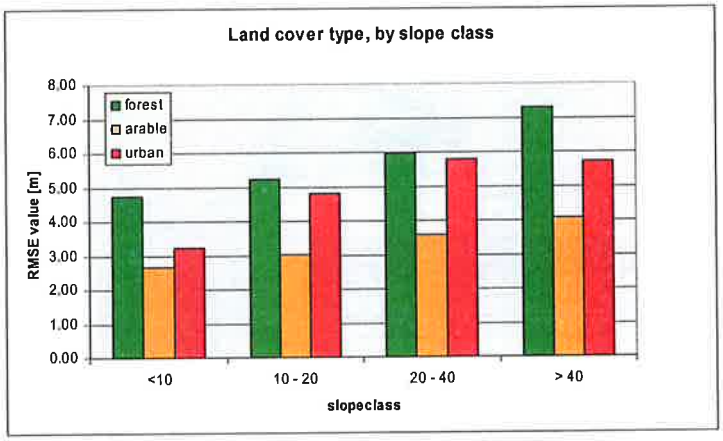

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Conclusion

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- This presentation covered a preliminary evaluation of the test carried out by the JRC and FÖMI to determine the suitability of the SPOT Image Reference3D product:
  - The quality assessment methodology was developed at the JRC and discussed with SPOTImage, and executed by FOMI using high quality data available in Hungary.
- The results show that the Reference3D for the tile tested:
  - performed better than its standard specification,
  - is suitable for rectification of most VHR imagery in the context of IACS without further processing, besides projection/datum transformations.
- The authors would like to acknowledge the help of:
  - **Gergely Maucha, Janos Orban, Rezso Solymosi, Robert Pataky (FÖMI)**
  - **Marc Bernard, Pierre Boubée (SPOT Image)**
  - **IGN (France)**

Presentation 2 – CwRS in 2004 POLAND

Jacek PODLEWSKI,
ARIMR, PL

Abstract

The presentation provides an overview of the implementation control system in Poland especially of the implementation of the Control with Remote Sensing. At the beginning it presents general overview of control system in Poland which is conducted by ARMA. ARMA is responsible for administering quite a wide range of schemes such as: direct payments, rural development plans, fruits & vegetable, fisheries and others. Most of them are controlled on the spot by 16 regional offices. Control of direct payments is delegated to the external contractors and in this case, the Agency carries out quality checks. In Poland we didn't apply conventional CwRS. We used two control methods: classic on-the-spot checks and "photo" method (RFV). The presentation gives information about how LPIS and GPS were used in Poland during control campaign in the year 2004. In classic on-the-spot-checks in Poland GPS was mainly used to measure agricultural parcels of large areas and good width-length proportion. In Photo (RFV) method we used satellite (IKONOS, QUICKBIRD) and airborne images. On base of this images were made orthophotos. Agriculture parcels measurement and sometimes crop identification (if it was possible) was made on the base of orthophotos. Main way for crops identifications and good agriculture conditions ("photo" method) in Poland was rapid field visit.
The presentation gives final results of control campaign and about the first year of IACS implementation in Poland.

Keywords: the spot checks, Control with Remote Sensing (CwRS), LPIS, GPS, rapid field visits (RFV), orthophotos, mobile inspector

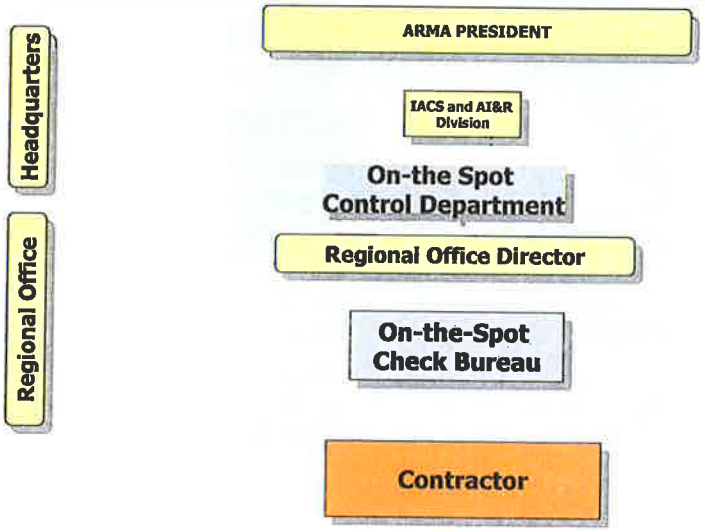
POLAND

Agency for Restructuring and Modernisation of Agriculture

ARMA – on the spot service

ARMA is responsible for servicing of quite wide range of schemes like: direct payments, rural development plans, fruits & vegetable, fisheries and others. Most of them are controlled on the spot by the 16 regional offices. Control of direct payments and LFA is delegated to the external contractors and in this case, the Agency are carrying out quality checks. ARMA for those purposes employs 228 inspectors.

On-the-spot check services organisation



Number of checks

Methods of on-the-spot checks used in Poland

1. **Traditional field inspections**
2. **Remote Sensing (CwRS) - RFV method**

Number of applications	Number of applications selected for field inspection	Number of applications selected for RFV check	Total %	Area applied	Area controlled
1 400 180	67 407	9 964	5,53	13 769 093 ha	1 475 000 (10,9%)

On the-spot checks

✓16 tenders

✓Classic method: 5.07 – 15.09

✓5 tenders

✓RFV method: 9.08 - 28.09

✓Contractors

✓Min. 2% quality control (~4%)

Timeframe of on-the-spot checks related to direct payments

Traditional field inspections

Basic checks	July 5 – September 15. 2004
Quality checks	July 12 – September 30. 2004

RFV method

Basic checks	August 9 – September 28. 2004
Quality checks	August 23 – November 30.2004

Additional selection checks

Carried out between October 1 and October 31

2356 holdings (0.17% of applications)

LPIS data submitted to contractors (field inspection)

1. Agricultural holding data and holder's data from the application filed by the agricultural producer – numeric format (70%) or paper form (30%)
2. Data on cadastral parcels area - numeric format
3. Raster (78%) cadastral maps - coordinate system WGS 84, Geo TIFF format
4. Vectorised (21%) cadastral maps - coordinate system WGS 84, GML/XML format
5. Hard copies of cadastral maps of areas for which no raster and no vectorised cadastral maps (1%)

LPIS data submitted to contractors (RFV method)

1. Agricultural holding data and holder's data from the application filed by the agricultural producer – numeric format (100%)
2. Data on cadastral parcels area (100%) - numeric format
3. Vectorised (100%) cadastral maps – coordinate system WGS 84, GML/XML format
4. Orthophotomaps (100%) – coordinate system PUWG 1992, Geo TIFF format

Kind of images used for RFV

Kind of images	Ikonos	QuickBird	Aerial photo
Resolution of images	PAN 0.82 m	PAN 0.61 m	0.25 m
	MS 3.28 m	MS 2.44 m	
Resolution of ortofotomap	1 m	0.7 m	0.25 m

Ortofotomaps used in control RFV

	Mazowieckie GROI/GARI	Opolskie KLUI	Łódzkie LOWQ	Podkarpackie LEZA	Warmińsko Mazurskie BARI
Ortofotomap	IKONOS (500 km²)	IKONOS (250 km²)	QuickBird (730 km²)	Archive ortofotomap	IKONOS/ QuickBird (500 km²)
Date of aquisition of images	14-15 IV	15 IV	01 V and 20 V	Archive ortofotomap 2003r	14 IV and 20 IV

Including:

IKONOS/QuickBird 1980 km²

Archive ortofotomap c.a. 500 km²

Measuring equipment used vs. the type of agricultural parcels

- ***GPS*** – to measure agricultural parcels of large areas and good width-length proportion; the better length-width proportion. the more justified the use of GPS.
- ***Total Station*** – high-precision measurement. may be used on all types of agricultural parcels (irrespective of their shape and size).
- ***Measuring tape*** – to measure agricultural parcels of small areas and regular shares (rectangular, triangular, square).
- ***Measuring tape and GPS*** – recommended to measure long parcels but of regular shape –longer sides to be measured with GPS, shorter sides – with the measuring tape.

Measuring equipment GPS used by inspectors during 2004 control campaign in Poland

Currently the Agency has:

- GPS receiver integrated with palmtop
  – Trimble GeoXT

- GPS receivers + palmtops
  – GPS Leica Gs20
  – Palmtop - Symbol PTT 8800

Measuring equipment GPS used by inspectors during 2004 control campaign in Poland (cont.)

GPS measuring equipment used during 2004 control campaign in Poland for determination of arable land limits, measurement of the agricultural parcel areas and measurements of the areas on which principles of maintaining good farming standards are not observed.

Next control campaign ARMA is going to extend functionality of the GPS hardware adding GPRS modems for effective communication by e-mail and developing application for support the process of the control.

The aim of the project „Mobile Inspector"

The Project „Mobile Inspector" prepared by ARMA will support the process of control (transmission of data necessary to carry out control) and enable inspectors to deliver their every day reports to the Regional On-the-Spot Control Offices. It will widening use of equipment which is already used by Agency.

Elaboration of this project will ensure:

– Effective communication of the inspectors - by e-mail.

The aim of the project „Mobile Inspector (cont.)

- Transmission of data necessary to carry out control (alphanumeric data and graphical data)
- Delivering of information necessary to execute control (answers to questions, updating of guidelines and books of procedures)
- Delivering of the inspectors' work progress
- Monitoring of inspector's work (localisation based on GPS measurements)

GPS Measuring equipment used by contractors during - RFV

For gathering control data during RFV inspectors used mainly palmtops with GPS receivers allow for real-time identification of all relevant information related to agricultural parcel being included in areabased aids.

GPS receivers with palmtops were used for :

- determining of the inspector position at the field
- measuring of the agricultural parcel areas
- measuring of the slope

Irregularieties found during the control campaing in first year of IACS implementation in Poland

Voivodship	Level of irr.(%) SAPS	Level of irr.(%) CNDP
Dolnośląskie	18,24%	18,39%
Kujawsko-pomorskie	14,49%	14,44%
Lubelskie	10,41%	10,39%
Lubuskie	17,74%	22,28%
Łódzkie	15,94%	15,12%
Małopolskie	10,11%	10,37%
Mazowieckie	15,24%	17,99%
Opolskie	20,07%	22,52%
Podkarpackie	13,81%	14,96%
Podlaskie	9,71%	10,55%
Pomorskie	27,71%	28,18%
Śląskie	12,46%	18,33%
Świętokrzyskie	24,58%	23,02%
Warmińsko-mazurskie	21,86%	22,81%
Wielkopolskie	12,46%	11,96%
Zachodniopomorskie	26,51%	30,11%
Total	15,34%	16,13%

Conclusions / Plans 2005

- ✓ higher level of use of LPIS data
- ✓ GPS – main measerment tool
- ✓ outsourcing of OTS (inc. CwRS)
- ✓ extension of (RFV) method
- ✓ decrease number of contractors/regions

Agency for Restructuring and Modernisation of Agriculture

On-the-Spot Control Department
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Fax: +48 22 318 53 20

Ladies and Gentlemen,
thank you for your attention

Presentation 3 – A modern, GIS enabled, on-line data capture system for the submission of subsidy applications.

Gregory Stefanakos,
O.P.E.K.E.P.E. (Greek Payment Agency)

Abstract

Greek Ministry of Agriculture's Payments Agency (OPEKEPE) are about to pilot-test a data capture application for the subsidy applications of Greek farmers. The software – called "GRmap" – is a web-based application that will materialize a seamless database with all alphanumeric and spatial data pertaining to the applications / claims.

The alphanumeric tables will include the "business data" of the claims and will support cross-referencing with external sources (for data validation), while the spatial tables will include all spatial entities (parcels, administrative boundaries, cadastral, orthophotos e.t.c.). GRmap is designed to support over 3.000 on-line users ("data capturers") throughout Greece, who will log on, enter the alphanumeric data and digitize the corresponding parcels on-line.

The use of GRmap is expected to produce two very significant benefits:

1. Since the "raw" data entered will be validated upon entry, GRmap will ensure data integrity and, moreover, substantially reduce the time span between the deposit of the claim by the applicant and the actual payment.
2. Right after its initial operation cycle, GRmap will provide a highly accurate and dependable data repository of all rural spatial entities (arable crops, olive parcels, grazing land e.t.c.). It will, therefore, actually update the country's Land Parcel Identification System (LPIS) and, moreover, it will also serve as a reference base for all the existing applications that handle spatial information for rural areas.

For building GRmap, a combination of eSpatial and Oracle technology is used. The system is built using an open, standards-based, platform-independent architecture, rather than separate GIS infrastructure, resulting in complete flexibility and compatibility. Deployment within the Oracle environment additionally ensures reliability, scalability and security.

Keywords: LPIS, IACS, Data Capture, iSMART, Oracle, Spatial

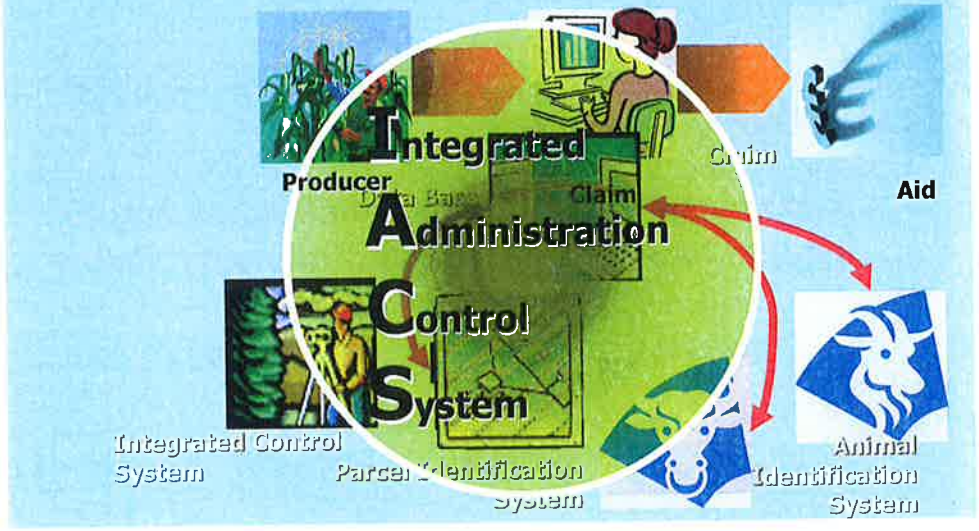
GRmap **:**

A modern, GIS enabled, on-line data capture system for the submission of subsidy claims

Outline of this presentation

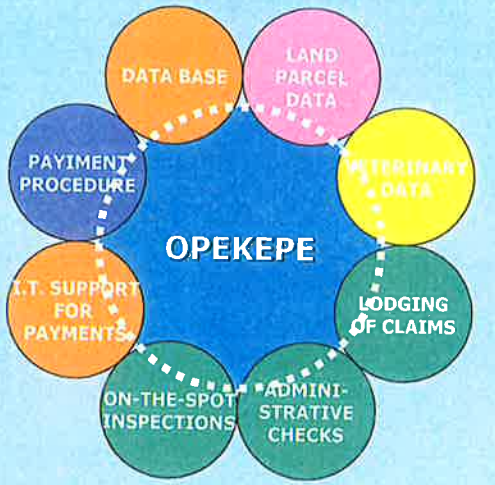
1. Brief background information
2. Existing situation
3. Drawbacks & Problems
4. Initial approach
5. Proposed solution (GRmap)
6. Resulting benefits.

IACS: The basics



> 1. Background information (outline)

IACS : The Role of OPEKEPE



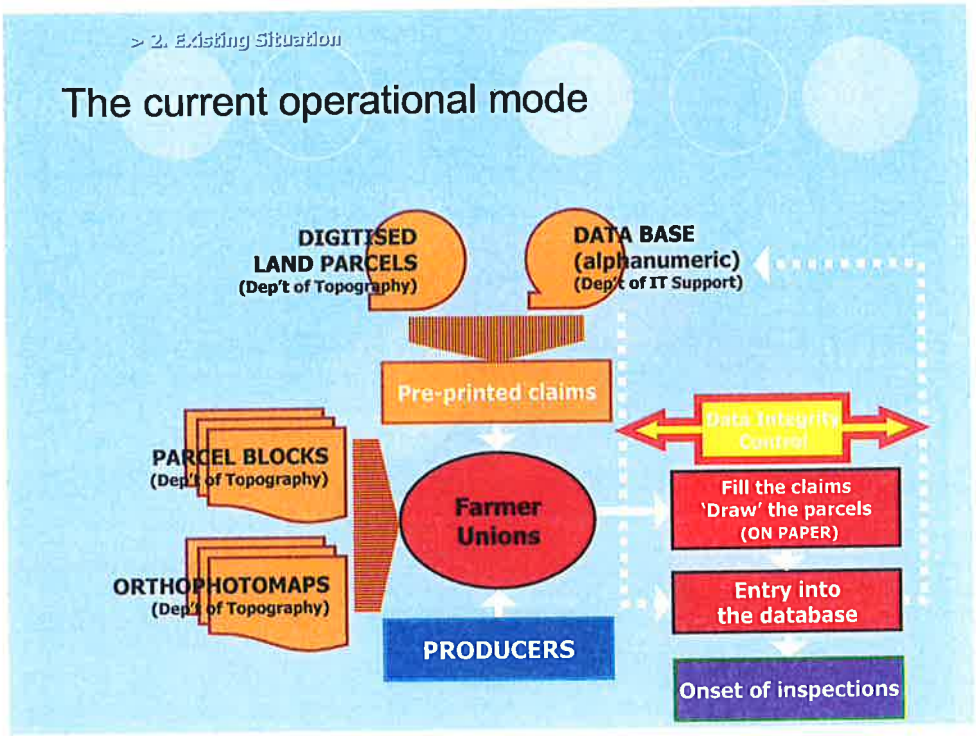
- Department of Topography
- IT Department
- Veterinary Department
- Prefectures
- Bank

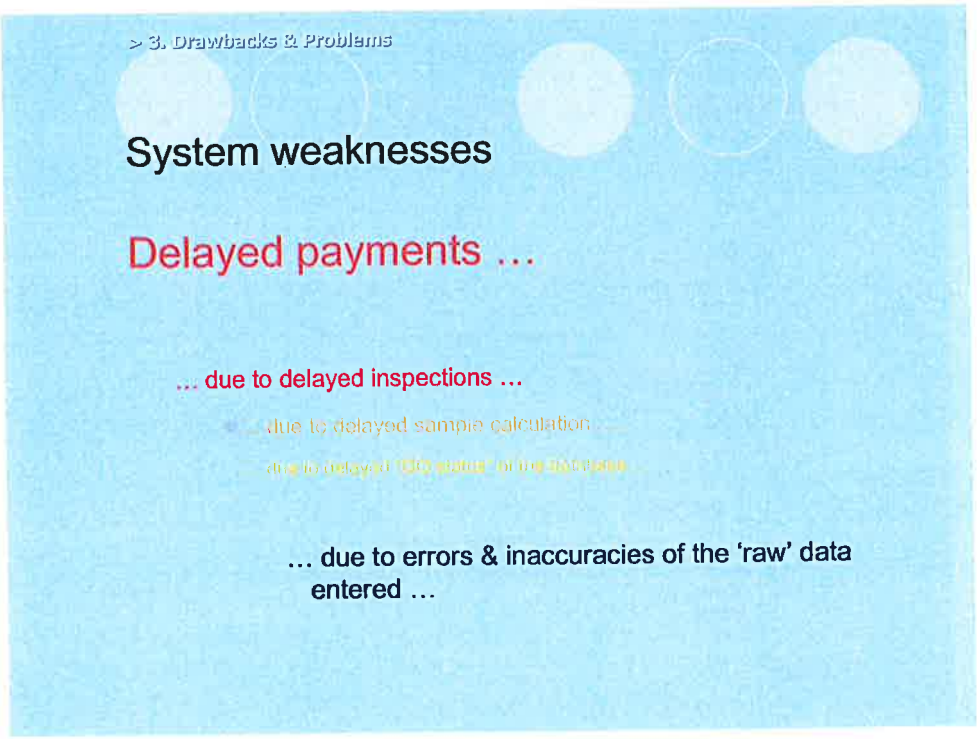
> 1. Background information (outline)

Greek IACS in numbers (2003)

- Arable
  - 3,4 m. parcels – roughly 1/3 of Greece
  - 450.000 claims
- Bovine
  - 380.000 animals (approx)
  - 25.000 claims
- Sheep & Goats
  - Over 11 m. animals
  - 120.000 claims.
- Other schemas
  - Olive oil
  - Cotton
  - Tobacco
  - Other

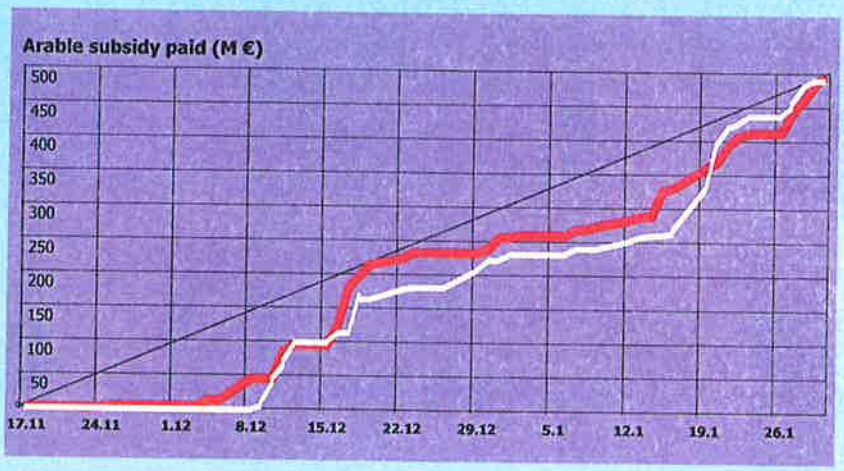
TOTAL


> 2. Existing Situation
The current operational mode
DIGITISED LAND PARCELS (Dep't of Topography)
DATA BASE (alphanumeric) (Dep't of IT Support)
Pre-printed claims
Data Integrity Control
PARCEL BLOCKS (Dep't of Topography)
Farmer Unions
Fill the claims 'Draw' the parcels (ON PAPER)
ORTHOPHOTOMAPS (Dep't of Topography)
Entry into the database
PRODUCERS
Onset of inspections


> 3. Drawbacks & Problems
System weaknesses
Delayed payments …
… due to delayed inspections …
… due to delayed sample calculation …
… due to errors & inaccuracies of the 'raw' data entered …

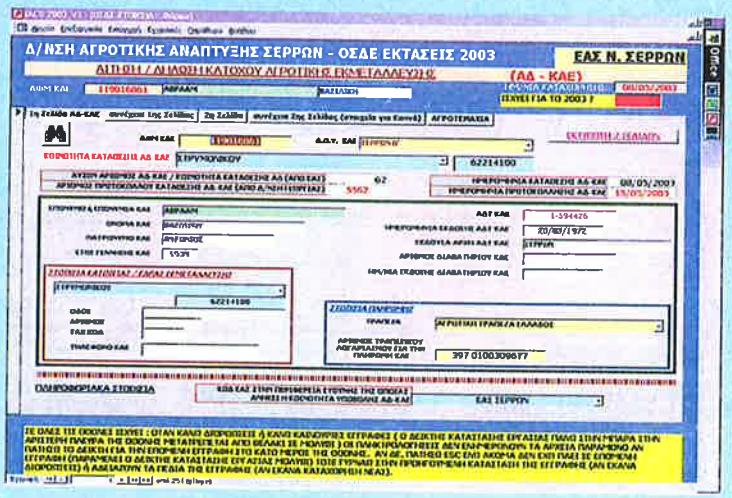
> 3. Drawbacks & Problems

IACS Payments



> 4. Initial approach

Initial approach (2003)



> 4. Initial approach

Initial approach (2003)

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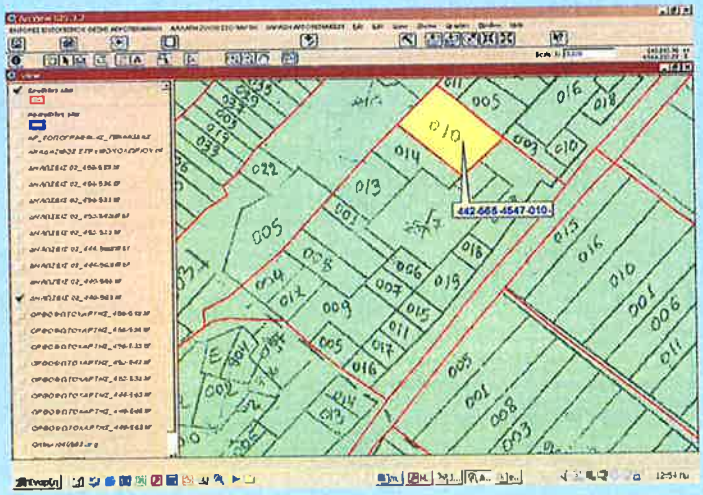
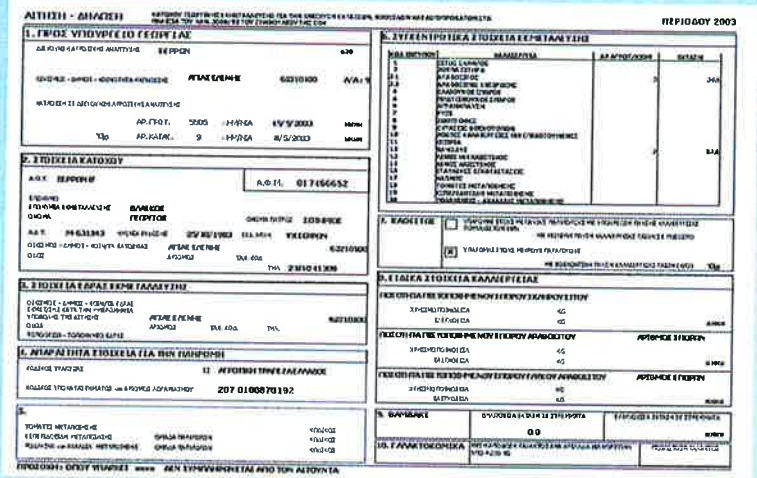
Initial approach (2003)



> 4. Initial approach

Initial approach (2003)



> 4. First attempt

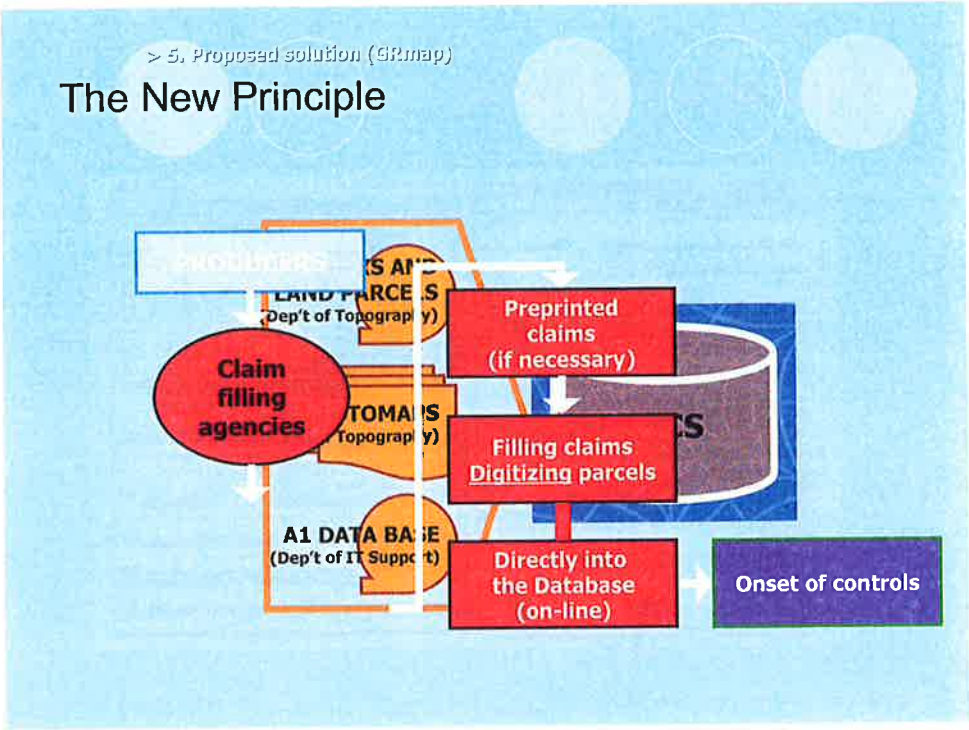
Benefits & Enhancements

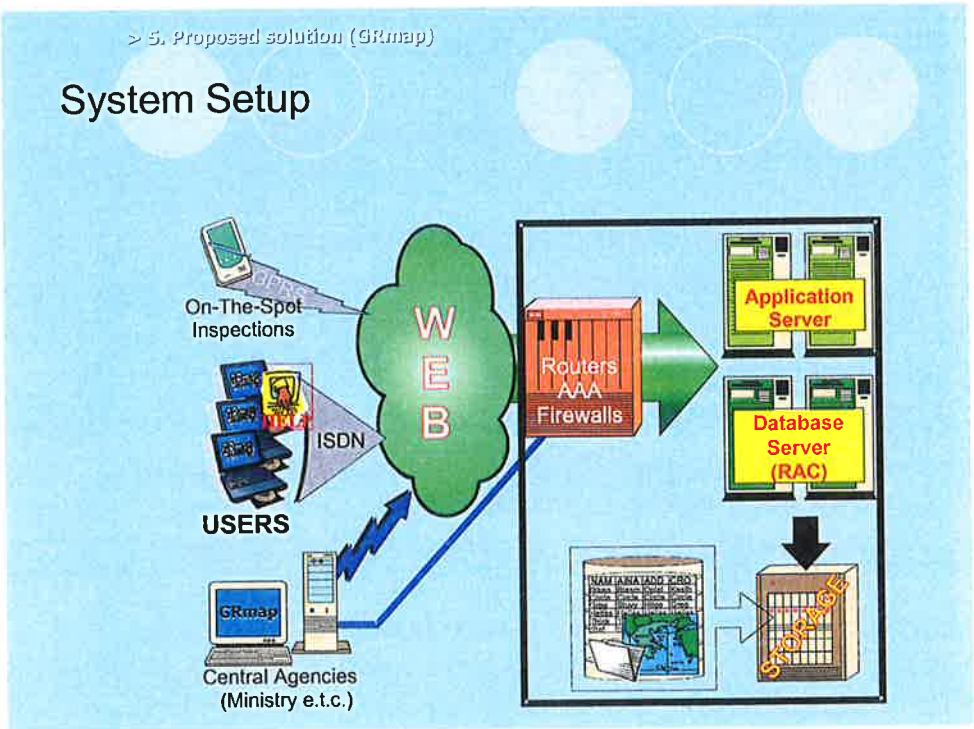
KEEP:

- Computer - aided claim submission
- Use of GIS functionality
- Presence of "historical data".

ADD:

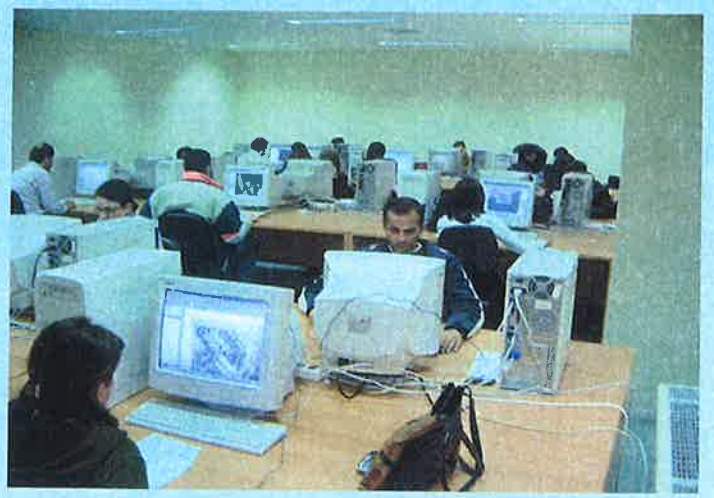
- Common, seamless DB for alphanumeric & spatial (raster & vector) data
- Multi-user application with real-time claim submission
- Data cross-checking with external sources
- On-the-spot printing of the claim, for protocol submission.


> 5. Proposed solution (GRmap)
The New Principle
Claim filling agencies
Preprinted claims (if necessary)
Filling claims Digitizing parcels
Directly into the Database (on-line)
Onset of controls


> 5. Proposed solution (GRmap)
System Setup
On-The-Spot Inspections
ISDN
USERS
GRmap
Central Agencies (Ministry e.t.c.)
WEB
Routers AAA Firewalls
Application Server
Database Server (RAC)
STORAGE

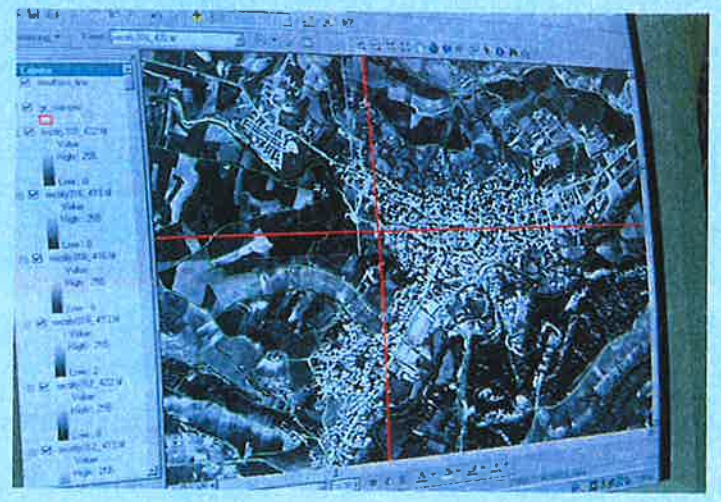
> 5. Proposed solution (GRmap)

Task 1: Preparing the data



> 5. Proposed solution (GRmap)

Task 1: Preparing the data



> 5. Proposed solution (GRmap)

Task 2: Building the software

GR map is being designed to be a…

- modern
- GIS enabled
- on-line (web-based)

…application for the submission of subsidy claims

> 5. Proposed solution (GRmap)

modern, because

- Is being build using an amalgam of eSpatial and Oracle technology
- Is an open, platform-independent, standards-based system (Java), allowing for complete flexibility and compatibility
- Uses n-tier architecture
- Is deployed totally inside the Oracle environment, ensuring reliability, scalability and security
- Uses data-driven, dynamic forms
- Requires no separate GIS platform.

> 5. Proposed solution (GRmap)

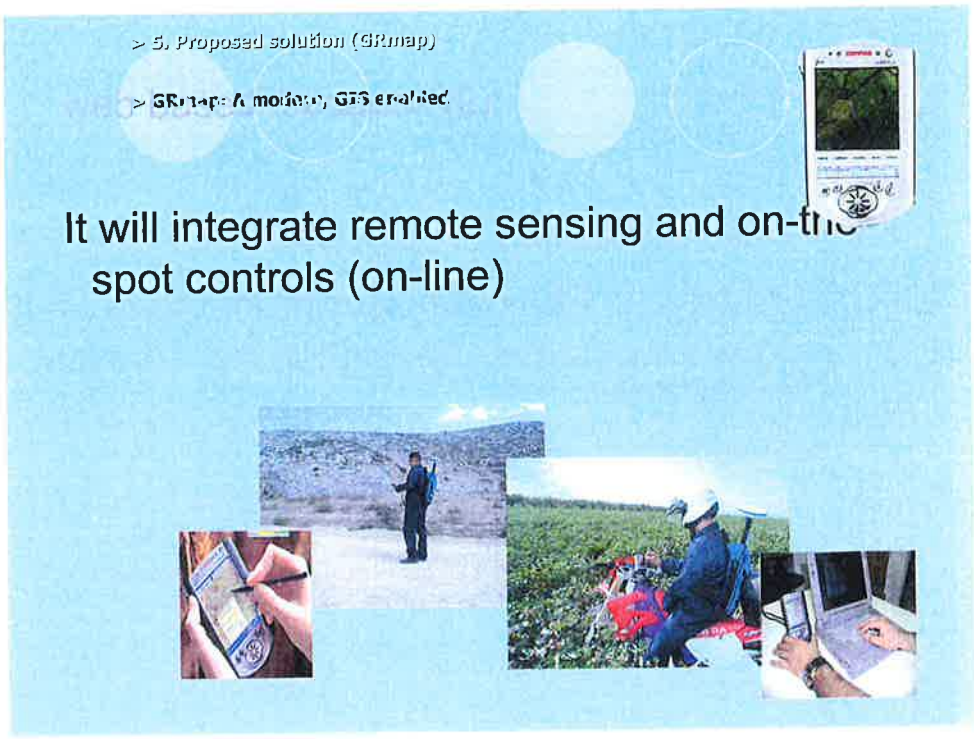
> GRmap: A modern,

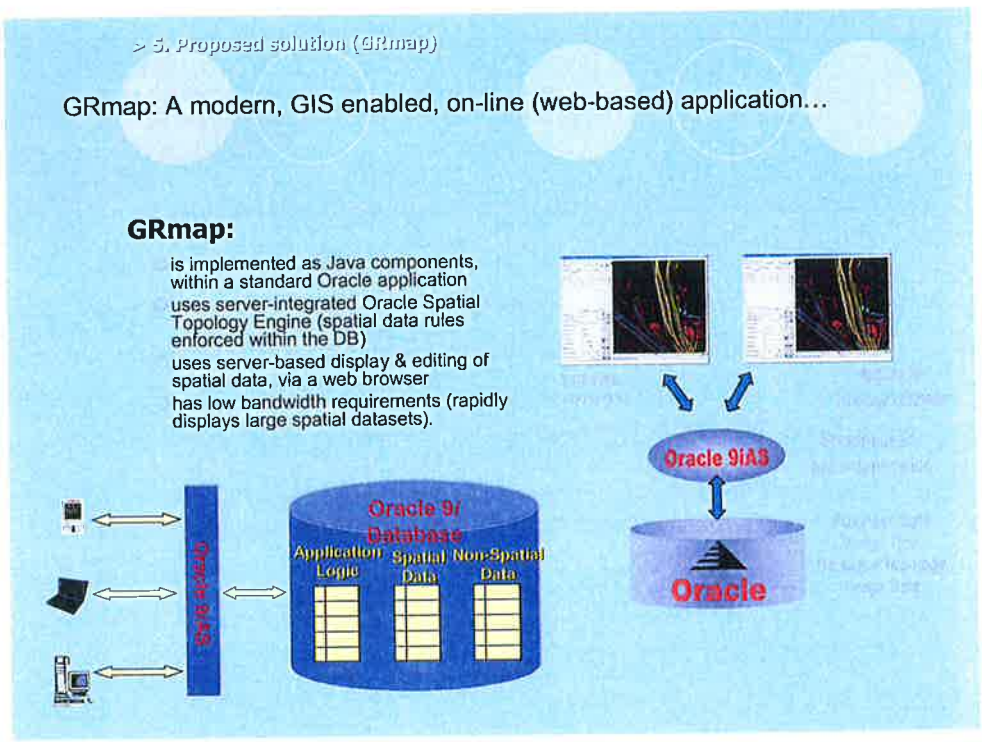
- It features a full range of coherent topological operations
- It features full GIS functionality within the DB and AS
- It uses tools to identify and correct spatial inconsistencies
- By storing topology in the database:
  - Double declared areas can be quickly identified
  - Areas are automatically checked against GIS data
  - At-source checking of distances and areas guarantees accuracy of inputs.

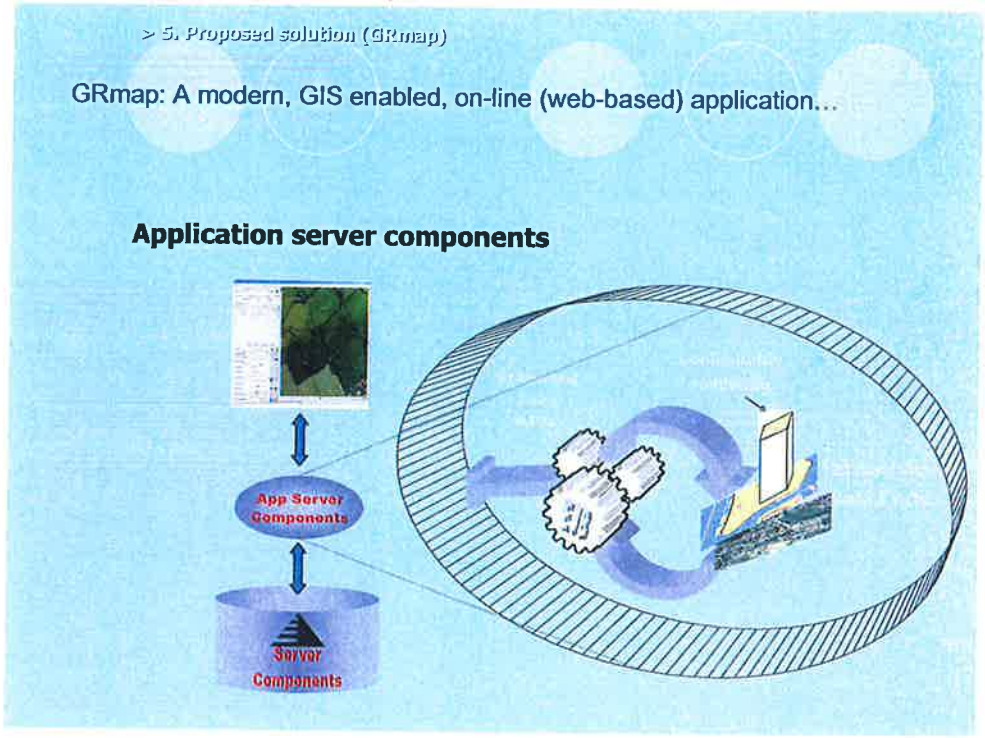
> 5. Proposed solution (GRmap)

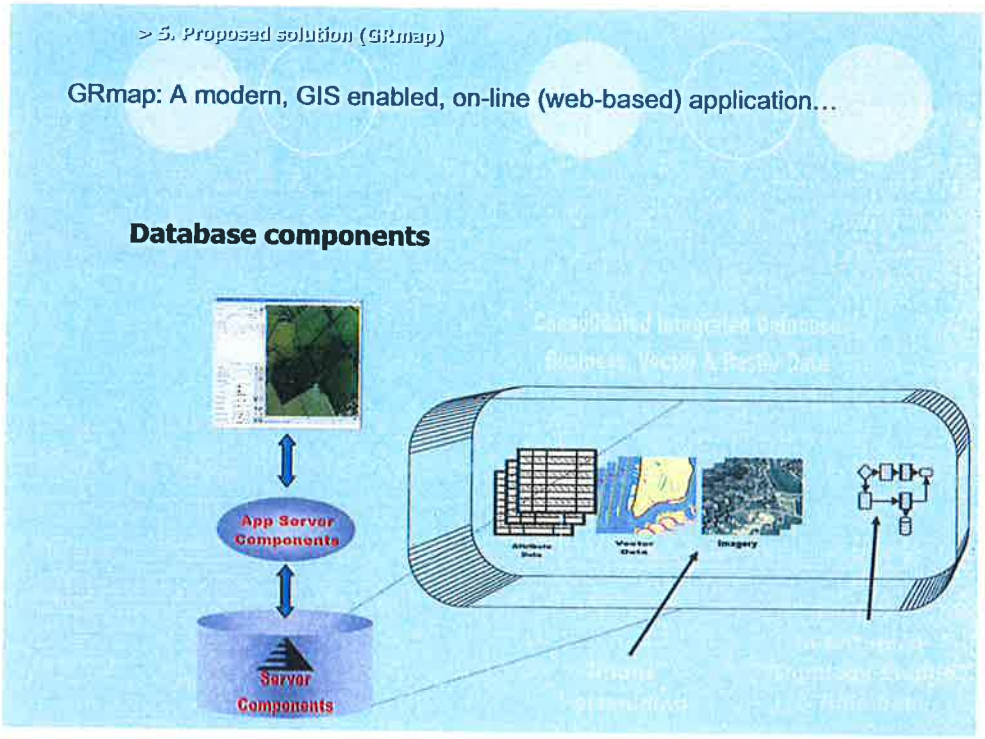
> GRmap: A modern, GIS enabled

- It enables spatial data access via standard web br on any client, including wireless
- It offers high speed access to imagery
- It is designed to support over 3.000 on-line users, throughout Greece
- It supports web-based vector editing:
  - Writes new data from web browsers, directly to database
  - Rejects conflicting updates ensuring data integrity
  - Farm inspectors and farmers can agree and view "live" data from the field.


> 5. Proposed solution (GRmap)
It will integrate remote sensing and on-the-spot controls (on-line)


> 5. Proposed solution (GRmap)
GRmap: A modern, GIS enabled, on-line (web-based) application...
GRmap:
is implemented as Java components, within a standard Oracle application
uses server-integrated Oracle Spatial Topology Engine (spatial data rules enforced within the DB)
uses server-based display & editing of spatial data, via a web browser
has low bandwidth requirements (rapidly displays large spatial datasets).
Oracle 9iAS
Oracle
Oracle 9i Database
Application Logic
Spatial Data
Non-Spatial Data


> 5. Proposed solution (GRmap)
GRmap: A modern, GIS enabled, on-line (web-based) application...
Application server components
App Server Components
Server Components


> 5. Proposed solution (GRmap)
GRmap: A modern, GIS enabled, on-line (web-based) application...
Database components
App Server Components
Server Components
Imagery

> 5. Proposed solution (GRmap)

GRmap: A modern, GIS enabled, on-line (web-based) application…

Maintaining the rules and the data in the same place, i.e. within Oracle, ensures:

- Data integrity – data protected at the database
- Ease of integration – directly to the database
- Ease of maintenance – no proprietary interfaces
- Enterprise Oracle QoS
- Transactional integrity
- Security
- Scalability
- e.t.c.

> 5. Proposed solution (GRmap)

Summing up…

GRmap is a modern, GIS enabled, on-line (web-based) application…

- Built using iSmart & Oracle technology
- Designed to support over 3.000 on-line users throughout Greece
- Uses a seamless Oracle database containing all data pertaining to the subsidy claims:
  - alphanumeric tables
    - containing business data (supports cross-referencing with external sources - for data validation)
  - spatial tables
    - containing all spatial entities (parcels, administrative boundaries, cadastral, orthophotos e.t.c.)
- Will also accept inspection data
- Will 'blend in' with existing and forthcoming systems.

> 6. Resulting benefits

Benefits (administrative)

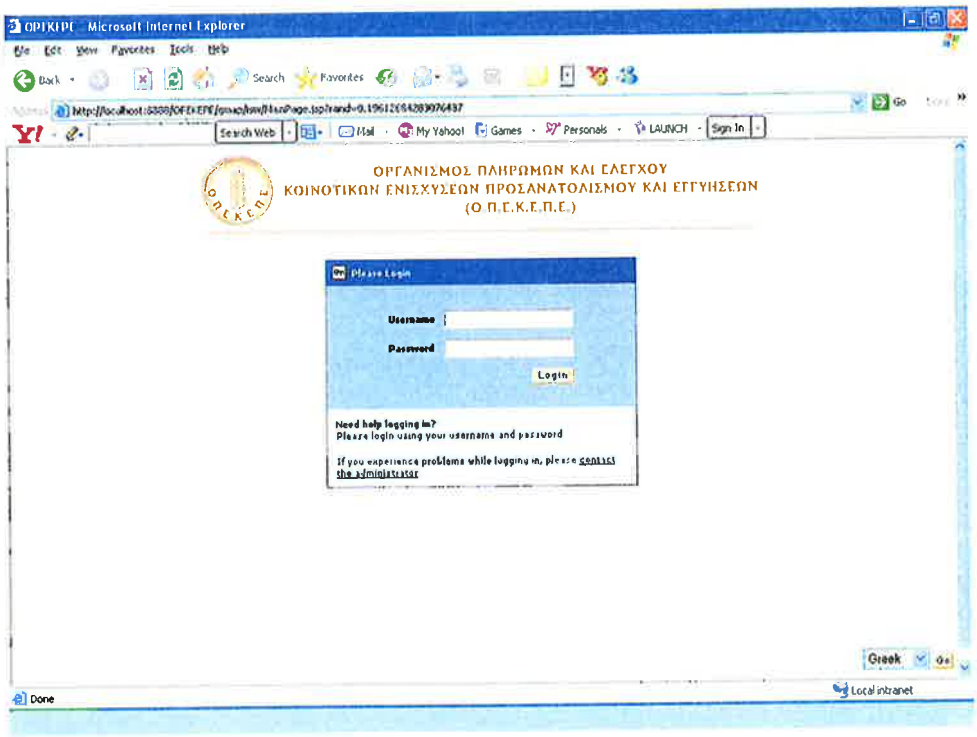
- "Raw" data entered will be validated upon entry
  - ensures data integrity
  - substantially reduces the time span between submitting the claim and the actual payment.
- Immediately provides a highly accurate data repository of all rural spatial entities (arable crops, olive parcels, grazing land e.t.c.)
  - Update the country's Land Parcel Identification System (LPIS)
  - Serve as a reference base for all the existing applications that handle spatial information for rural areas.

> 6. Resulting benefits

Benefits (technical)

- Traditional desktop GIS functionality within any spatial application on any web-enabled device
- Built within - rather than on top of - Oracle
  - Delivers high performance, while enabling the maintenance of large datasets (spatial & alphanumeric)
  - Ensures that all users view the same data & topology
- Delivers security, data & transaction integrity and reliability
- Offers guaranteed accuracy in subsidy payments
- Easily generate subsidy forms for all individual farmers
- Enables automated printing of pre-defined areas (e.g. fields of a given farmer).

skip screens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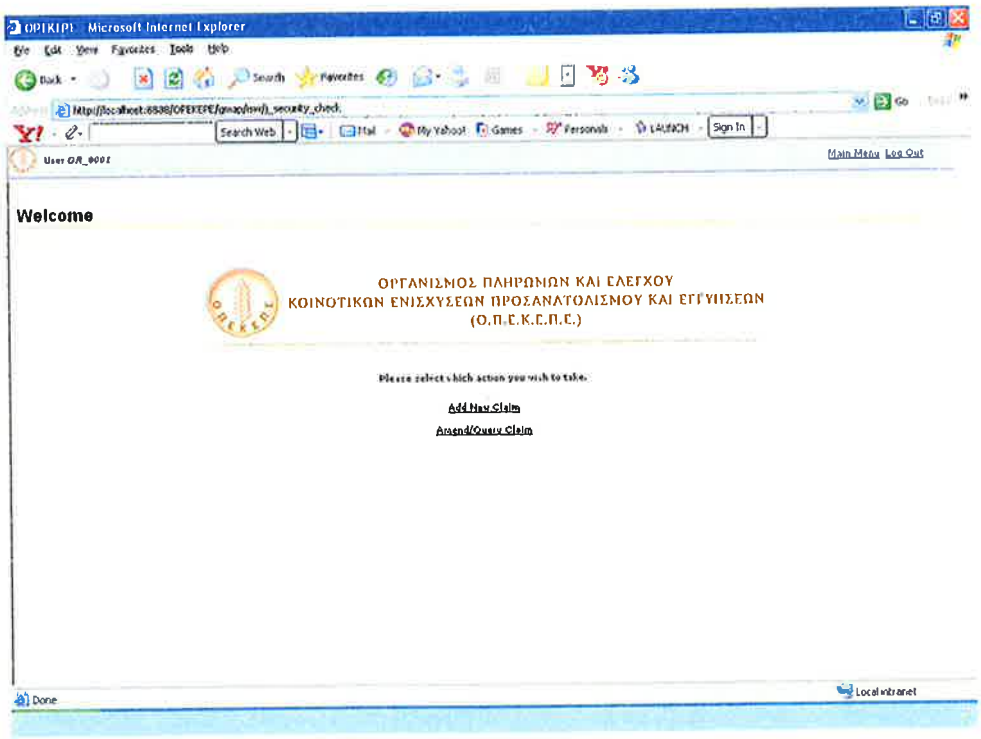
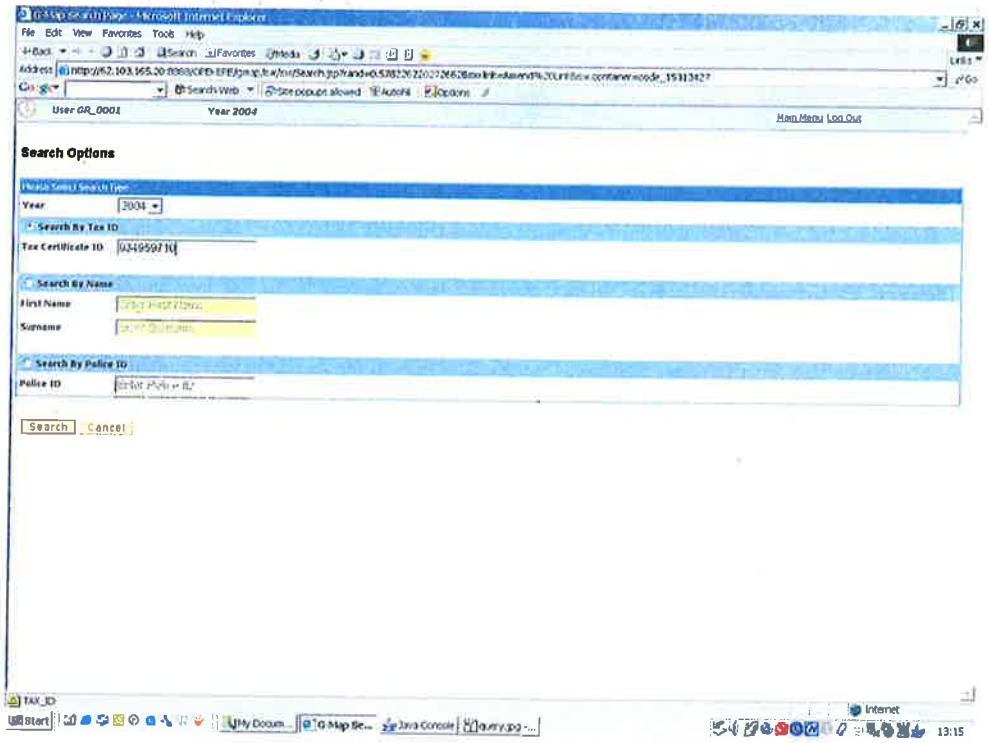
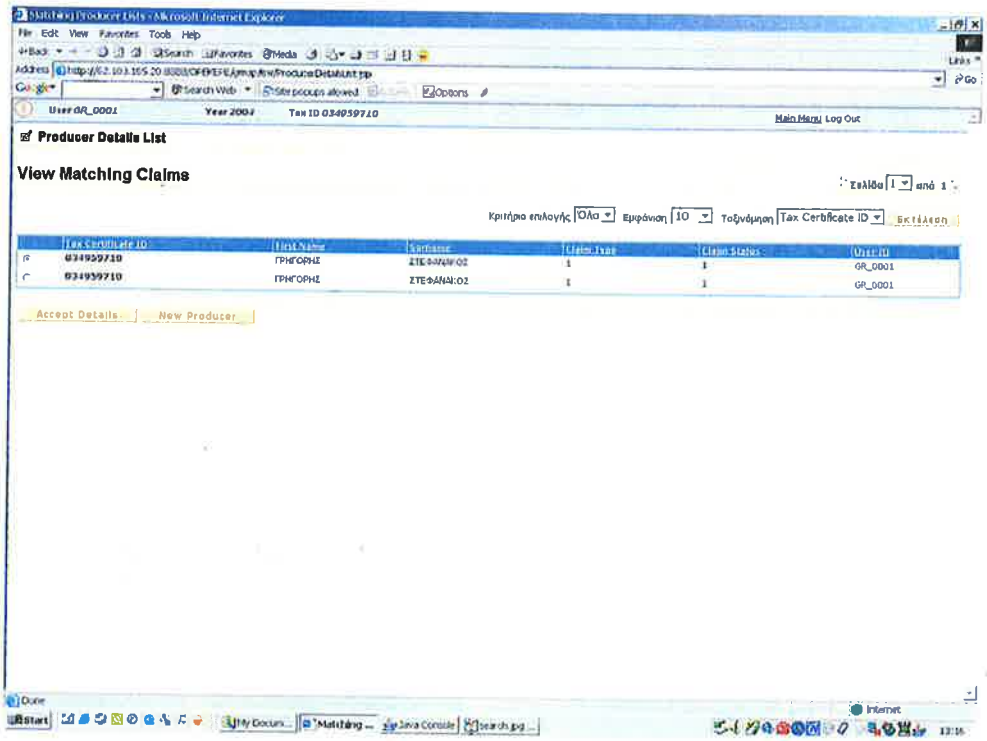
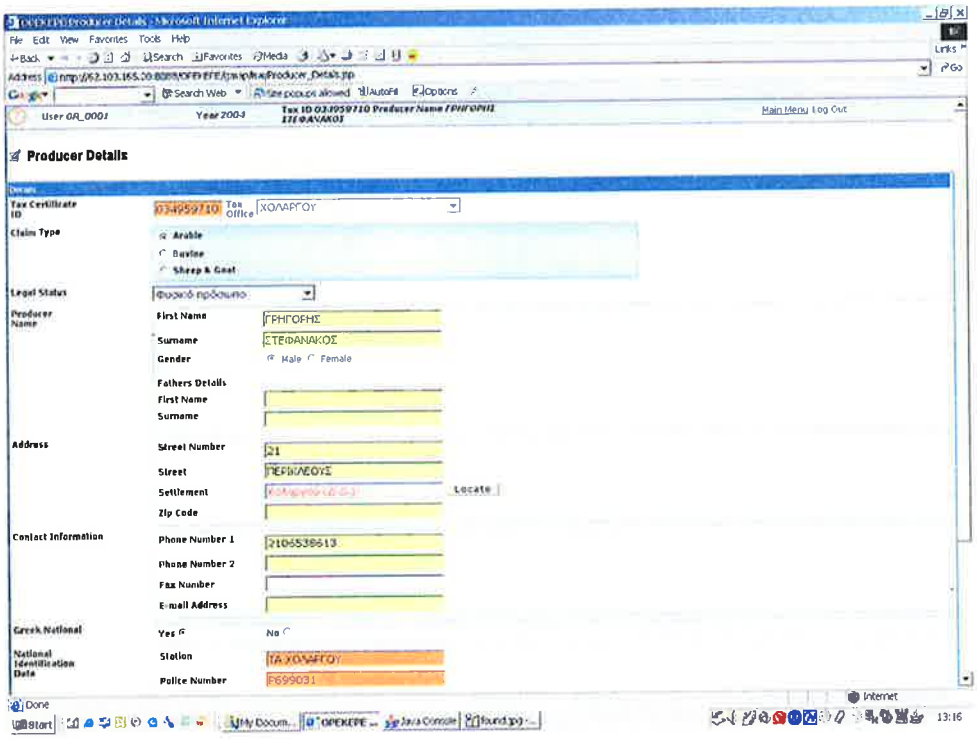
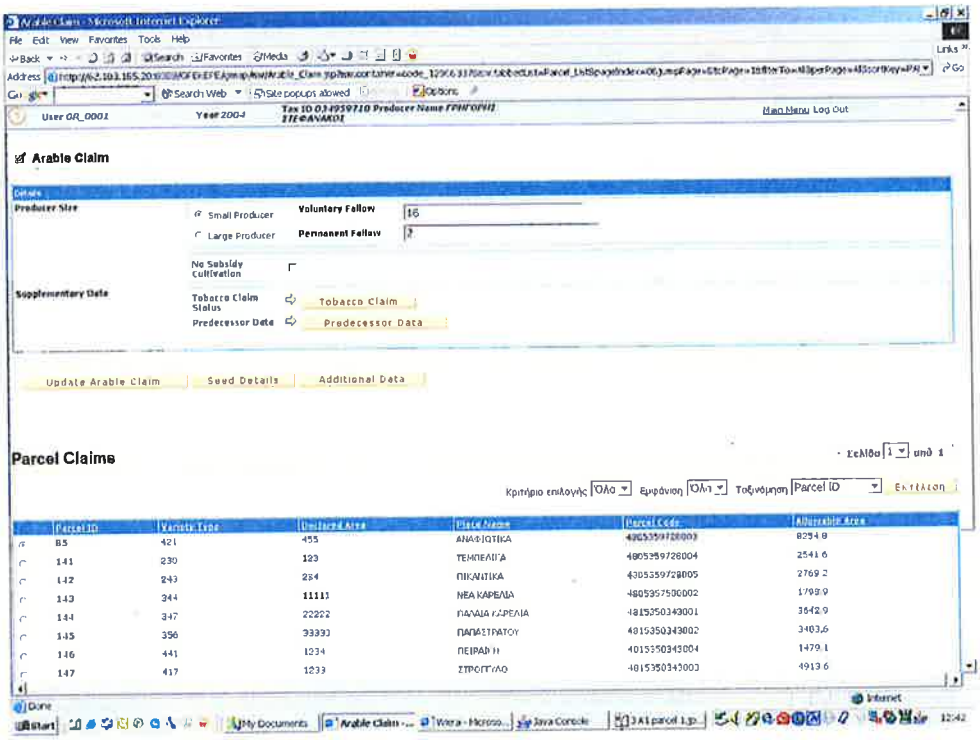
ΚΟΙΝΟΤΙΚΩΝ ΕΝΙΣΧΥΣΕΩΝ ΠΡΟΣΑΝΑΤΟΛΙΣΜΟΥ ΚΑΙ ΕΓΓΥΗΣΕΩΝ
(Ο.Π.Ε.Κ.Ε.Π.Ε.)
Please Login
Username
Password
Login
Need help logging in?
Please login using your username and password
If you experience problems while logging on, please contact the administrator
Greek
Done
Local intranet

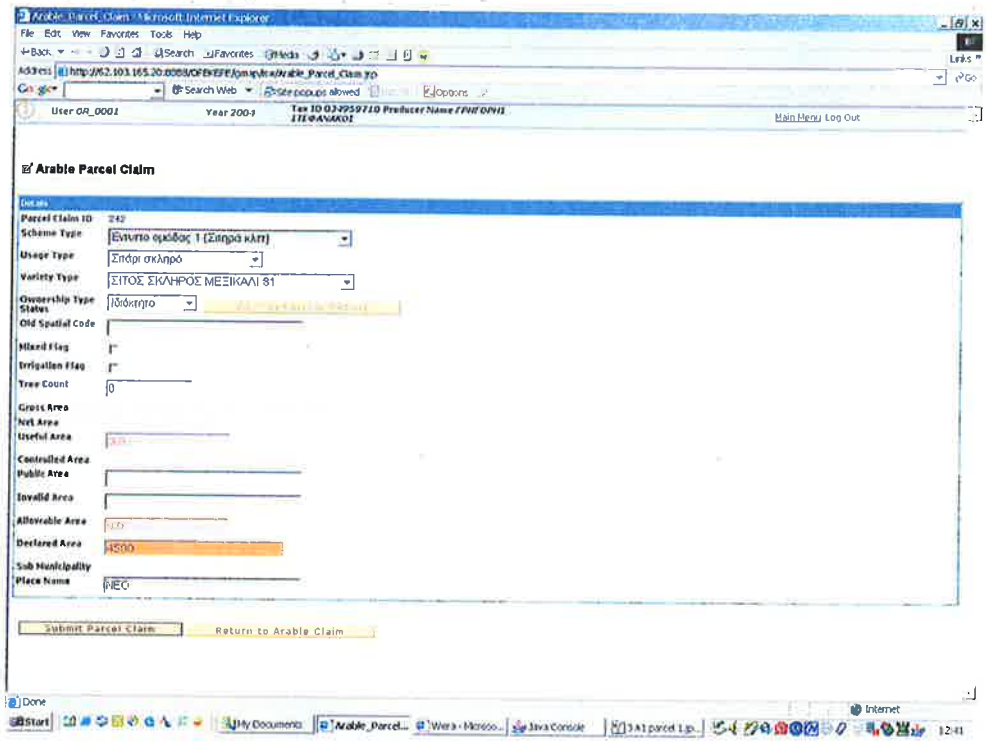

Welcome
ΟΡΓΑΝΙΣΜΟΣ ΠΛΗΡΩΜΩΝ ΚΑΙ ΕΛΕΓΧΟΥ
ΚΟΙΝΟΤΙΚΩΝ ΕΝΙΣΧΥΣΕΩΝ ΠΡΟΣΑΝΑΤΟΛΙΣΜΟΥ ΚΑΙ ΕΓΓΥΗΣΕΩΝ
(Ο.Π.Ε.Κ.Ε.Π.Ε.)
Please select which action you wish to take.
Add New Claim
Amend/Query Claim
Main Menu
Log Out
Done
Local intranet

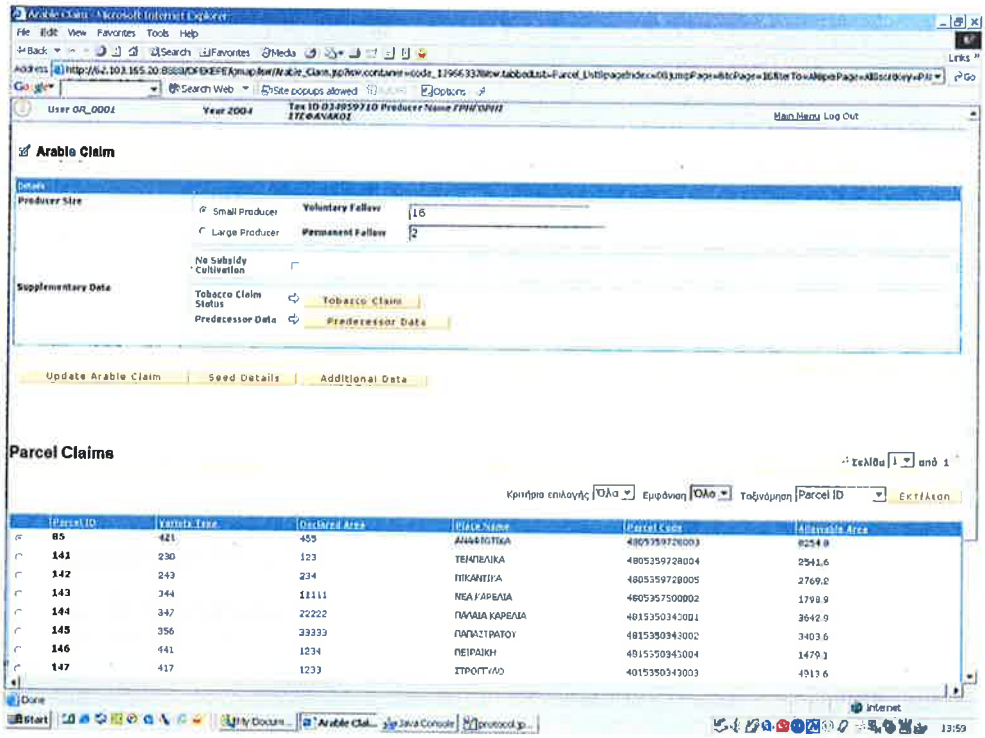

Search Options
Year
2004
Search By Tax ID
Tax Certificate ID
Search By Name
First Name
Surname
Search By Police ID
Police ID
Search
Cancel


Producer Details List
View Matching Claims
Accept Details
New Producer


Producer Details
Tax Certificate ID
Tax Office
Claim Type
Arable
Bovine
Sheep & Goat
Legal Status
Producer Name
First Name
Surname
Gender
Male
Female
Fathers Details
Address
Street Number
Street
Settlement
Zip Code
Locate
Contact Information
Phone Number 1
Phone Number 2
Fax Number
E-mail Address
Greek National
Yes
No
National Identification Data
Station
Police Number


Arable Claim
Producer Size
Small Producer
Large Producer
Voluntary Fallow
Permanent Fallow
No Subsidy Cultivation
Supplementary Data
Tobacco Claim Status
Predecessor Data
Tobacco Claim
Predecessor Data
Update Arable Claim
Seed Details
Additional Data
Parcel Claims


Arable Parcel Claim
Parcel Claim ID
Scheme Type
Usage Type
Variety Type
Ownership Type Status
Old Spatial Code
Mixed Flag
Irrigation Flag
Tree Count
Gross Area
Net Area
Useful Area
Controlled Area
Public Area
Invalid Area
Allowable Area
Declared Area
4500
Sub Municipality
Place Name
ΝΕΟ
Submit Parcel Claim
Return to Arable Claim


Arable Claim
Producer Size
Small Producer
Large Producer
Voluntary Fallow
16
Permanent Fallow
2
No Subsidy Cultivation
Supplementary Data
Tobacco Claim Status
Predecessor Data
Update Arable Claim
Seed Details
Additional Data
Parcel Claims
Parcel ID
Variety Type
Declared Area
Place Name
Parcel Code
Allowable Area
85 421 455
141 230 123 ΤΕΛΠΕΛΙΚΑ 4805359728004 2541.6
142 243 234 ΠΙΚΑΝΤΙΛΙΑ 4805359728005 2769.2
143 344 11111 ΝΕΑ ΚΑΡΕΛΙΑ 4805357500002 1798.9
144 347 22222 ΠΑΛΑΙΑ ΚΑΡΕΛΙΑ 4815350343001 3642.9
145 356 33333 ΠΑΠΑΣΤΡΑΤΟΥ 4815350343002 3403.6
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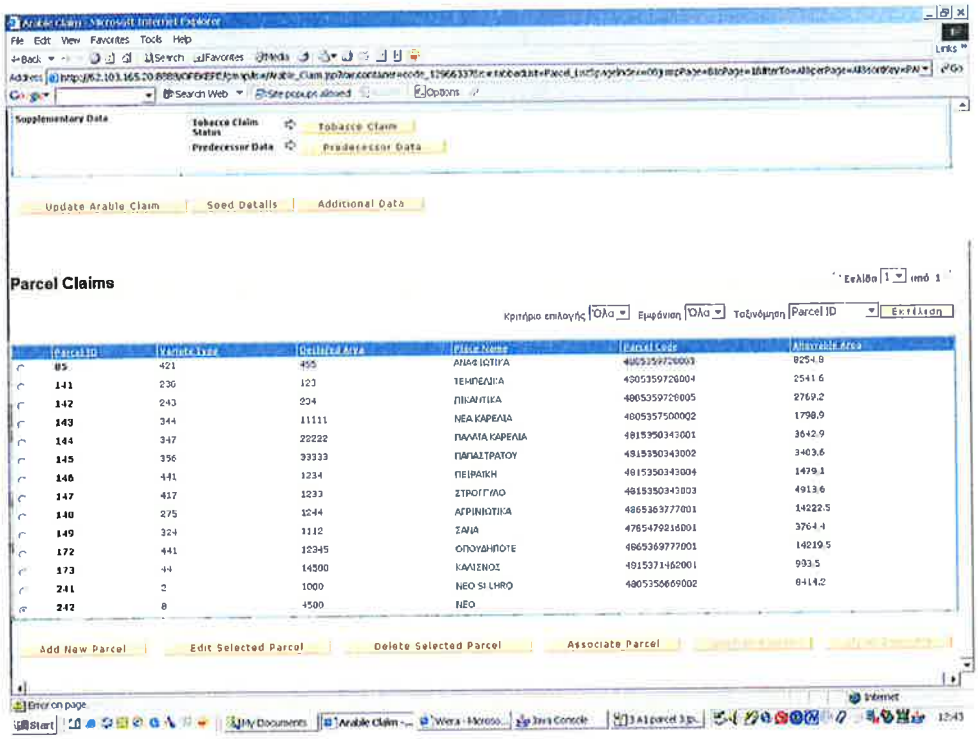
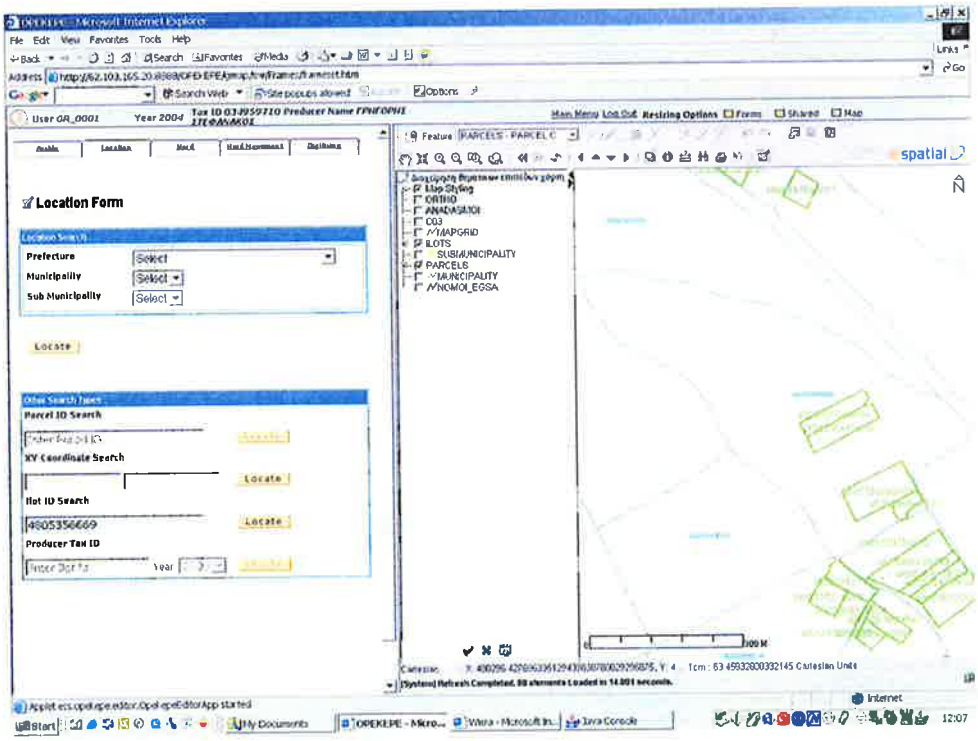
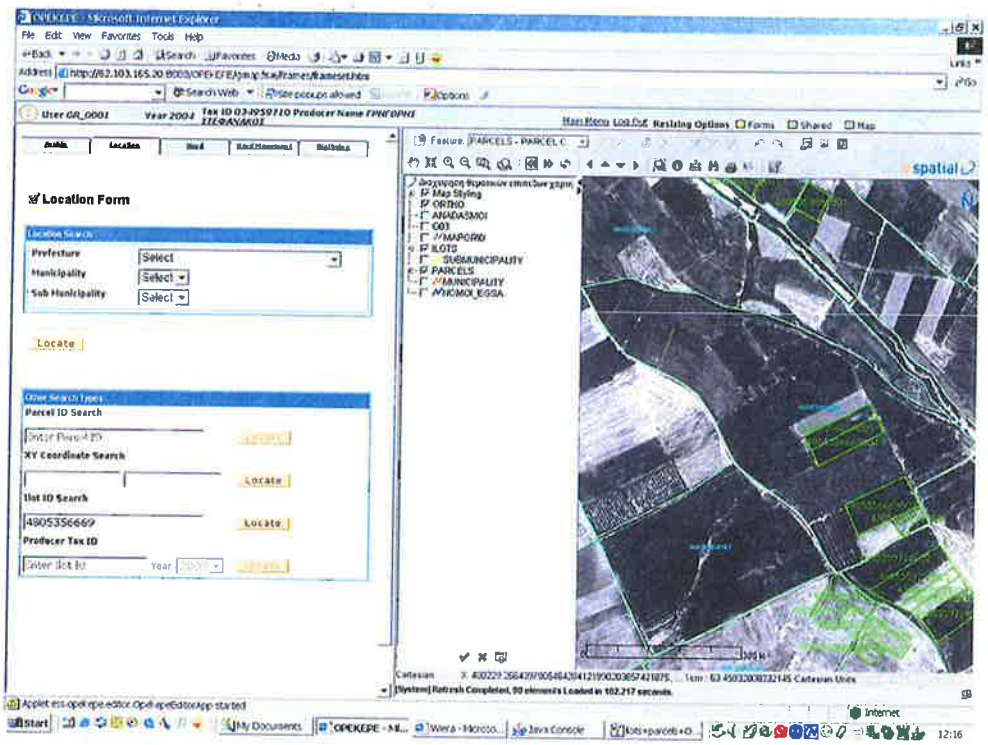
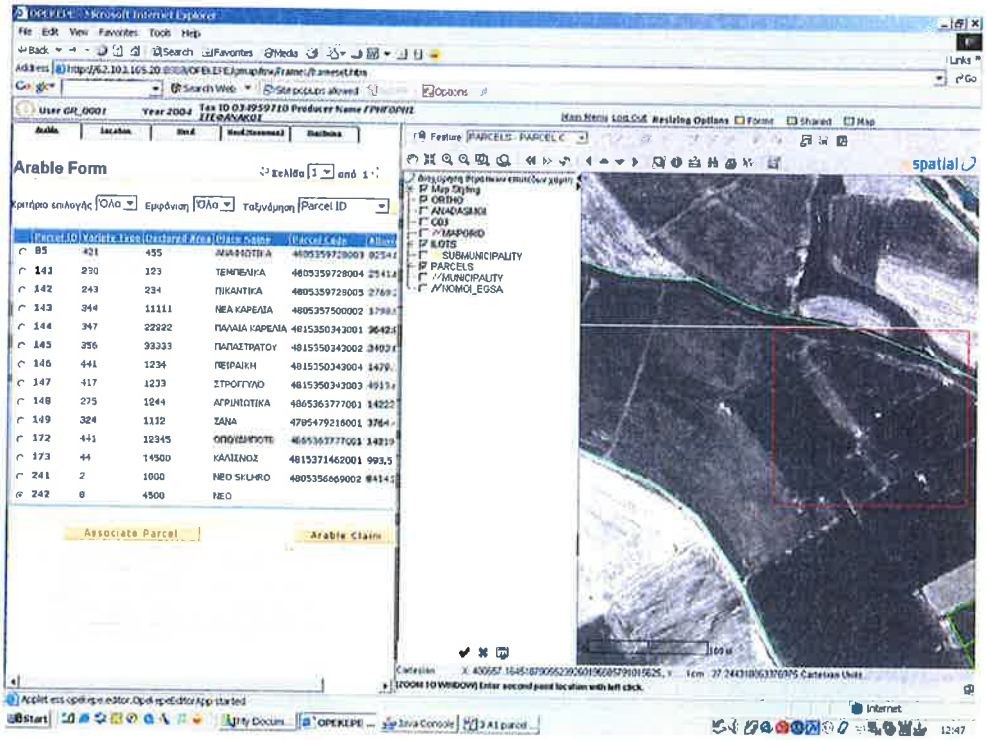
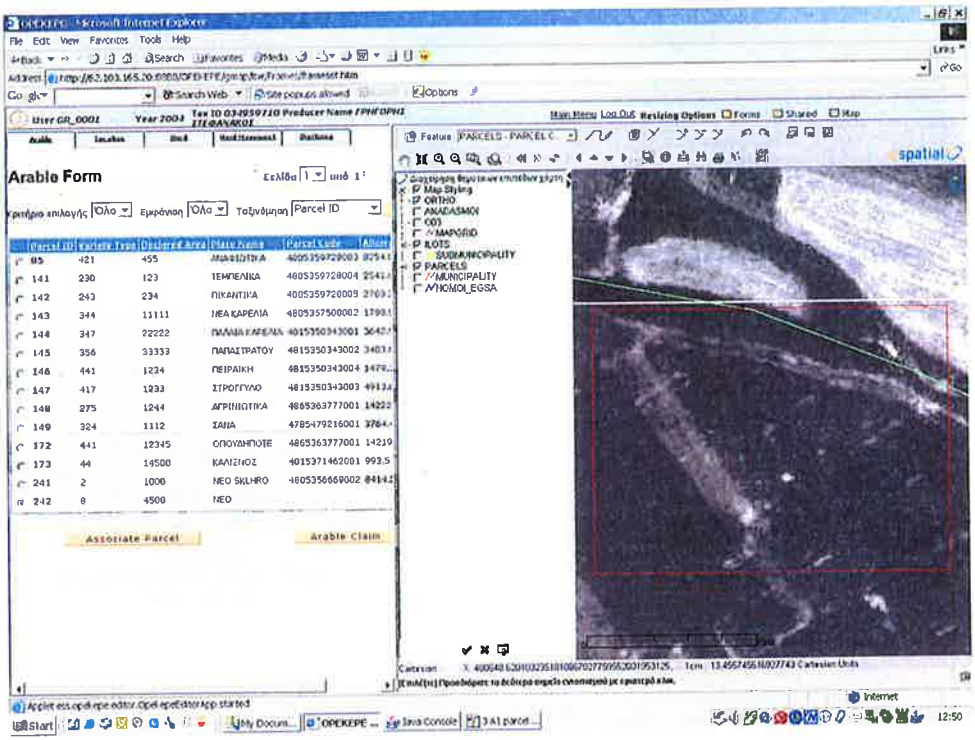
147 417 1233 ΣΤΡΟΓΓΥΛΟ 4815350343003 4913.6


Parcel Claims
Update Arable Claim
Seed Details
Additional Data
Add New Parcel
Edit Selected Parcel
Delete Selected Parcel
Associate Parcel


Location Form
Prefecture
Municipality
Sub Municipality
Locate
Parcel ID Search
XY Coordinate Search
Lot ID Search
Producer Tax ID
spatial


Location Form
Prefecture
Municipality
Sub Municipality
Select
Locate
Parcel ID Search
XY Coordinate Search
Producer Tax ID
spatial


Arable Form
Associate Parcel
Arable Claim
spatial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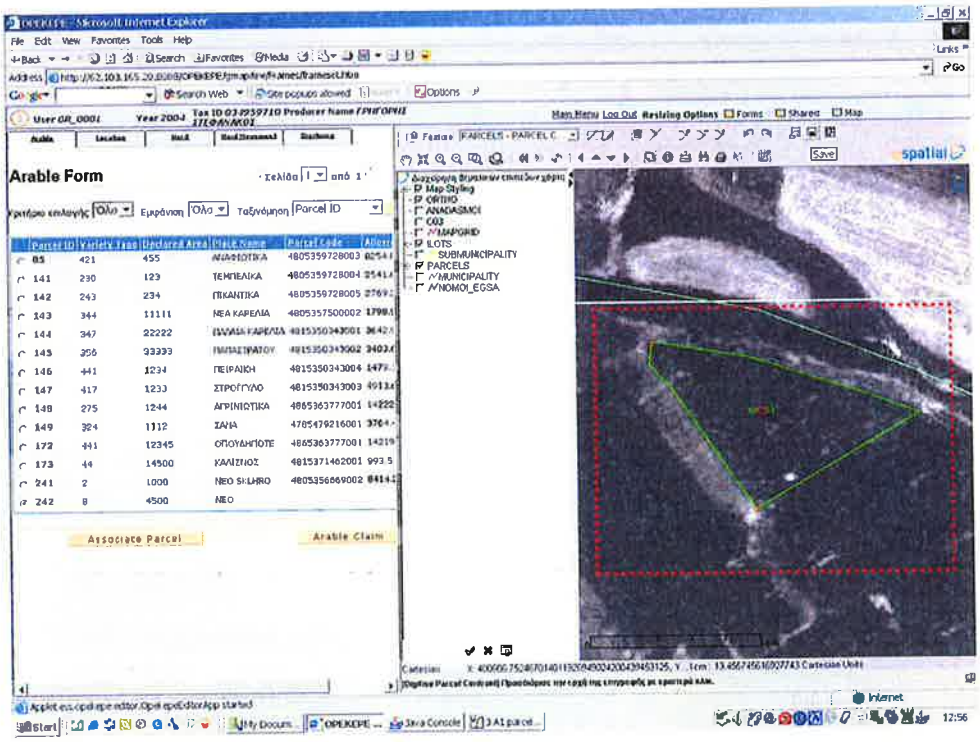
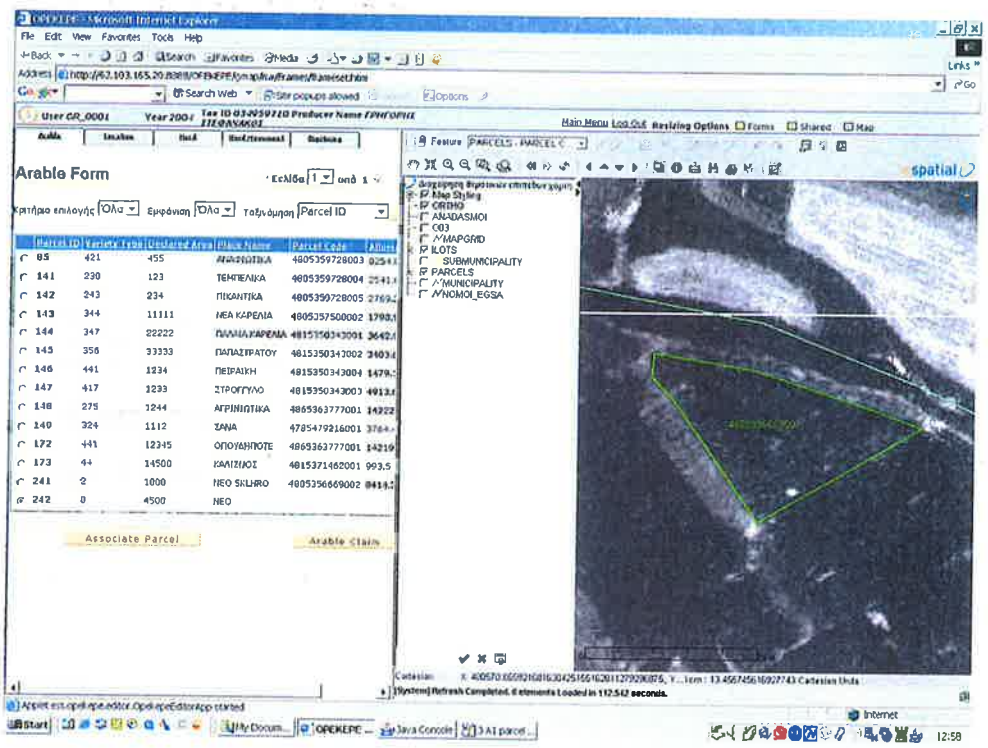
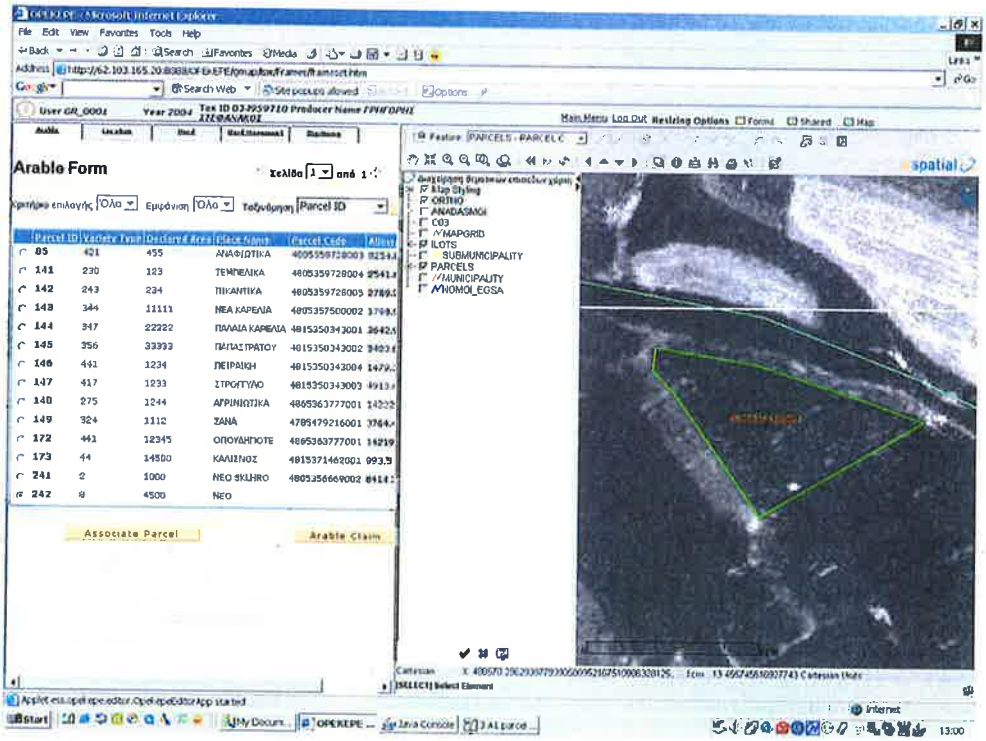
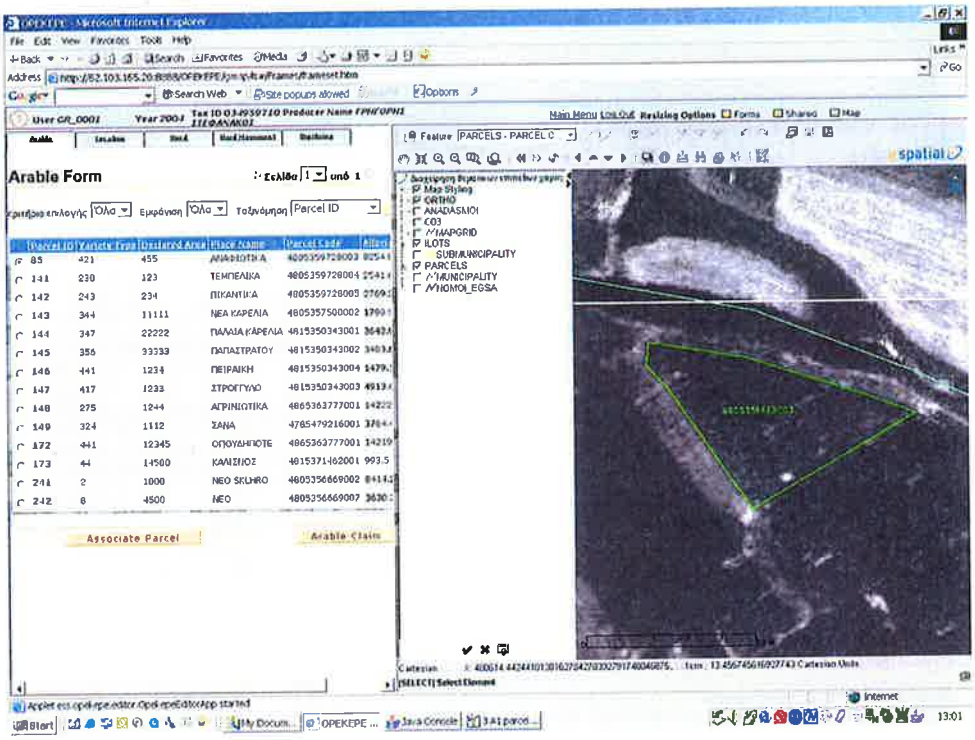
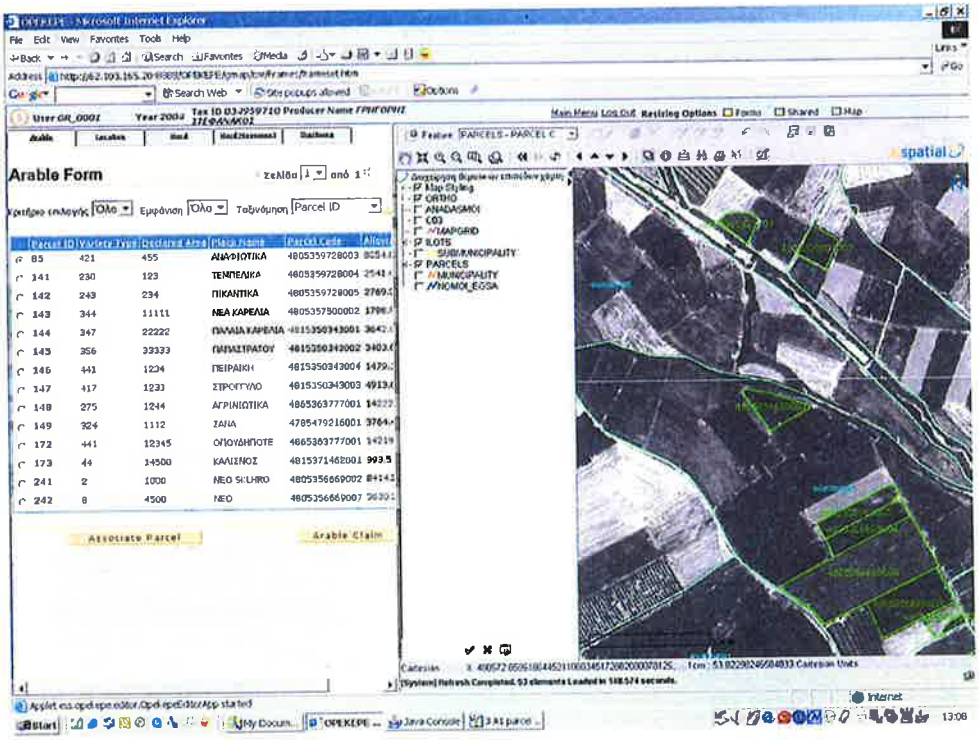
Associate Parcel
Arable Claim
spatial

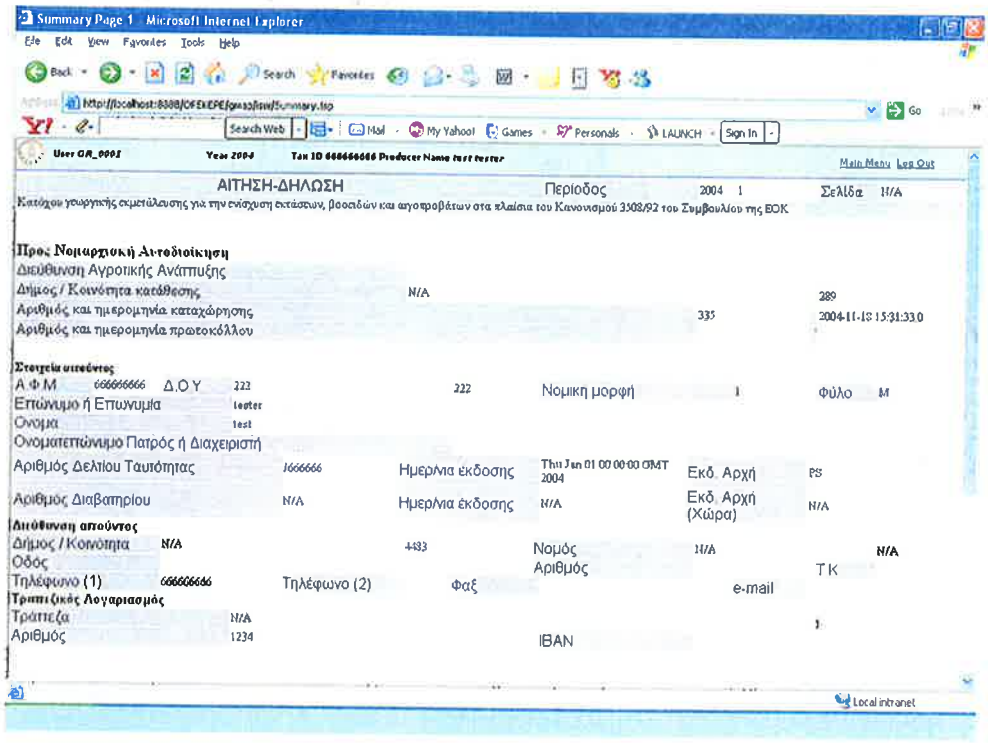

Arable Form
Associate Parcel
Arable Claim
spatial

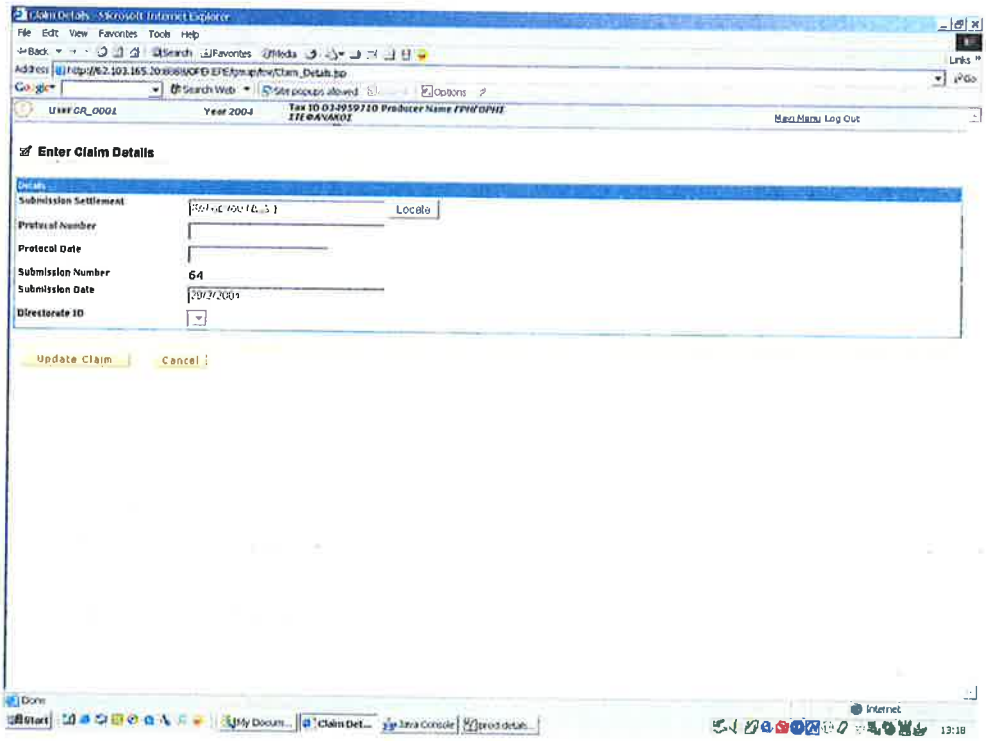

Arable Form
Associate Parcel
Arable Claim
spatial

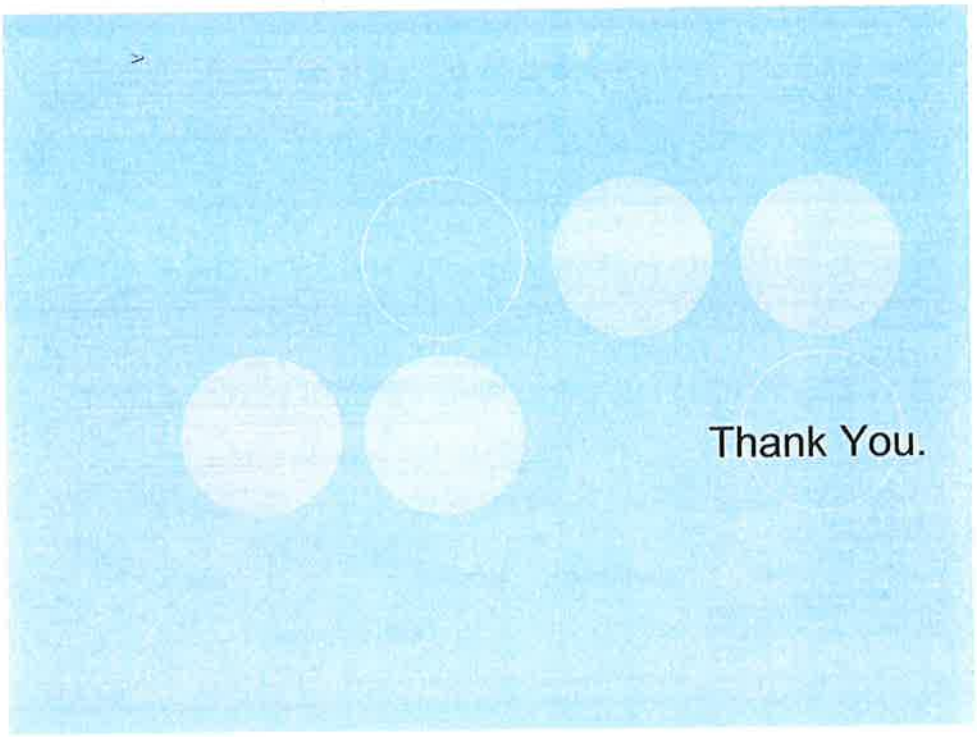

Arable Form
Associate Parcel
Arable Claim
spatial


Arable Form
Associate Parcel
Arable Claim
spatial


Arable Form
Associate Parcel
Arable Claim
spatial


Summary Page 1 - Microsoft Internet Explorer
ΑΙΤΗΣΗ-ΔΗΛΩΣΗ
Περίοδος 2004 1
Σελίδα N/A
Προς Νομαρχιακή Αυτοδιοίκηση
Διεύθυνση Αγροτικής Ανάπτυξης
Δήμος / Κοινότητα κατάθεσης N/A 289
Αριθμός και ημερομηνία καταχώρησης 335 2004-11-18 15:31:33.0
Αριθμός και ημερομηνία πρωτοκόλλου
Στοιχεία αιτούντος
Α.Φ.Μ 666666666 Δ.Ο.Υ 222 222 Νομική μορφή 1 Φύλο M
Επώνυμο ή Επωνυμία tester
Όνομα test
Ονοματεπώνυμο Πατρός ή Διαχειριστή
Αριθμός Δελτίου Ταυτότητας 1666666 Ημερ/νια έκδοσης Thu Jan 01 00:00:00 GMT 2004 Εκδ. Αρχή PS
Αριθμός Διαβατηρίου N/A Ημερ/νια έκδοσης N/A Εκδ. Αρχή (Χώρα) N/A
Διεύθυνση απούντος
Δήμος / Κοινότητα N/A 4433 Νομός N/A N/A
Οδός Αριθμός TK
Τηλέφωνο (1) 666666666 Τηλέφωνο (2) Φαξ e-mail
Τραπεζικός Λογαριασμός
Τράπεζα N/A 1
Αριθμός 1234 IBAN
Local intranet


Claim Details - Microsoft Internet Explorer
Enter Claim Details
Submission Settlement
Locate
Protocol Number
Protocol Date
Submission Number 64
Submission Date 20/3/2003
Directorate ID
Update Claim
Cancel


Thank You.

Session 6 – Preparation of the 2005 Campaign

Chairman: Pär Johan ÅSTRAND

Presentation 1 – Common Technical Specifications 2005: review of the main changes

Hérve KERDILES,
JRC, IPSC, Agrifish Unit

Abstract

The Common Technical Specifications (CTS) issued by the Commission, in collaboration with all Administrations, at the beginning of December every year for the next campaign define the common rules and tasks to be followed by any contractor/body performing on-the-spot checks using remote sensing imagery.

2005 is the first year of the entry into force of the CAP reform with the Single Payment Scheme (Cf. Council Regulation 1782/2003), which, among other changes, will link the payment of direct aid to compliance with rules relating to environment, food safety, animal health and welfare and good agricultural and environmental conditions (cross compliance). The coming years will be a transitional (and complicated) period for the management and control of the CAP subsidies as Member States will implement the Single Payment Scheme in different ways and at different dates. As a result, for 2005 at least 3 different types of schemes (with internal variations) will coexist.

Moreover, since the results of the 1st year of application of SAPS have not been analyzed yet (in particular with regard to cross compliance), a conservative approach was adopted for the CTS 2005. The few changes introduced will be presented: they concern the reference year check, possible adaptations to the CAPI checks and possible tests for the control of cross compliance.

Keywords: Common Technical Specifications, CwRS, CAP reform

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Common Technical Specifications 2005

review of the main changes

H. Kerdiles
JRC IPSC AGRIFISH

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Context: 2005, start of CAP reform

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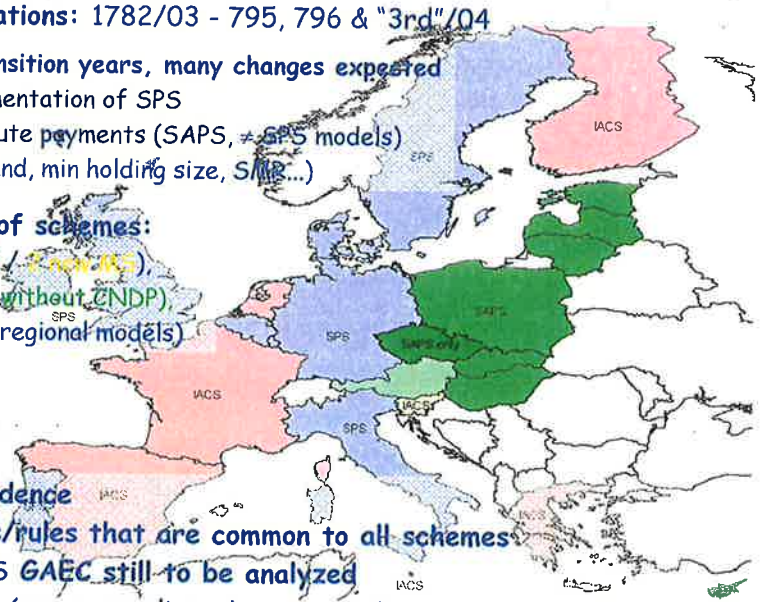
New set of regulations: 1782/03 - 795, 796 & "3rd"/04

-> 2005… 2009 transition years, many changes expected

- ≠ dates of implementation of SPS
- ≠ models to compute payments (SAPS, ≠ SPS models)
- ≠ rules (eligible land, min holding size, SMR…)

25 MS, 3 types of schemes:

- ✓ IACS (5 old MS / 7 new MS),
- ✓ SAPS (7 with/1 without CNDP),
- ✓ SPS (historical/regional models)



CTS strategy: prudence

- Keep strategies/rules that are common to all schemes
- control of SAPS GAEC still to be analyzed
- For new checks (cross compliance) propose alternatives & tests

CTS 2005 / HK

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Minor changes for CwRS contractors

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- **Management & control of entitlements (SPS)**
  - ↳ Administrative check -> no incidence on CwRS
- **Definition of crop and payment groups (all schemes)**
  - ↳ Cf. compulsory National Addendum
  - ↳ Diagnosis at level of payment group
  - ↳ 1 parcel may belong to >1 payment group (SAPS + CNDP1, SPS + ...)
- **Digital LPIS to be provided to the contractor** (vector, reference area, VHR ortho-imagery) -> less work for contractor

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Reference year eligibility checks

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- **Old MS (IACS): provision of 1987-91 HR imagery stopped** (in practice minor change - ref year check only made by NL & LU in 2004)
- **Old MS (SPS/IACS) -> 2003 eligibility check: land under perm pastures, perm. crops or trees, or used for non agricultural purposes in (spring) 2003 is not eligible for arable aid**
  rule concerns IACS arable crops, SPS set-aside, SPS arable crops partly coupled (art 108 & 54 of Reg. 1782/03)
- **New MS (SAPS) -> 2003 eligibility check: land should be in Good Agricultural Condition at 30/6/2003** (art 1b (4) of Reg. 1259/99)
- **SI & MT (IACS): land under permanent crops (grassland, orchard, wood) on 31/12/2000 are not eligible for aid**

-> eligibility check may be based on historical IACS DB, LPIS or CAPI of LPIS orthophoto to select parcels to be investigated

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CAPI check / classification

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- **At agricultural parcel level** (as before)
- **Check size, width, density** (of trees) **if relevant** (as before)
  - ✓ set-aside below min size not accepted even if rounded by permanent boundaries; but min size / width decreased to 0.1 ha / 10 m or 0.05 ha / 5m if justified environmental reasons (art 54 (4) of Reg 1782/03)
- **In schemes with payments linked to crop type** (IACS, SAPS+CNDP, SPS coupled/with specific crop payments), **focus CAPI on groups / crops receiving additional payments** (Cf. national Addendum)
- **In schemes where most crops are accepted and paid independently of crop type** (SAPS, SPS), **focus CAPI on detection of non-eligible uses / crops**

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Tolerance - reminder

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- Art 30 of Reg 796/2004: Tolerance shall not exceed 5% of measured area or a buffer of 1.5m applied to the perimeter of the agricultural parcel (max tolerance 1 ha).

-> no change!

1. **≤1.5m buffer tolerance -> recommended** (with current year VHR ortho-imagery)
2. 5% of measured area allowed but main rule is that tolerance should correspond to precision of instrument used
3. **Max (1.5m buffer tol, 5% area tol, 0.02ha)** possible
4. What to do if buffer > 1.5m e.g. due to failure of acquisition of VHR imagery (aerial or satellite) ?

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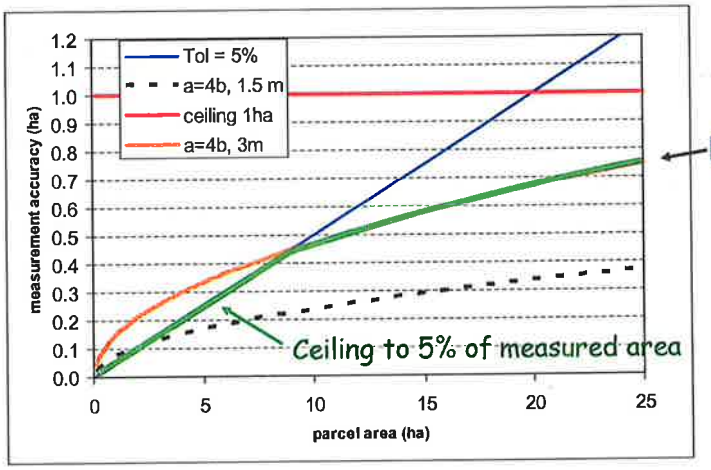
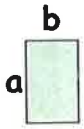
Ceiling when buffer > 1.5m

MARS

- If buffer > 1.5m, check if tolerance ≤ 5% of measured area, otherwise ceiling to 5% of measured area





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Ceiling when buffer > 1.5m

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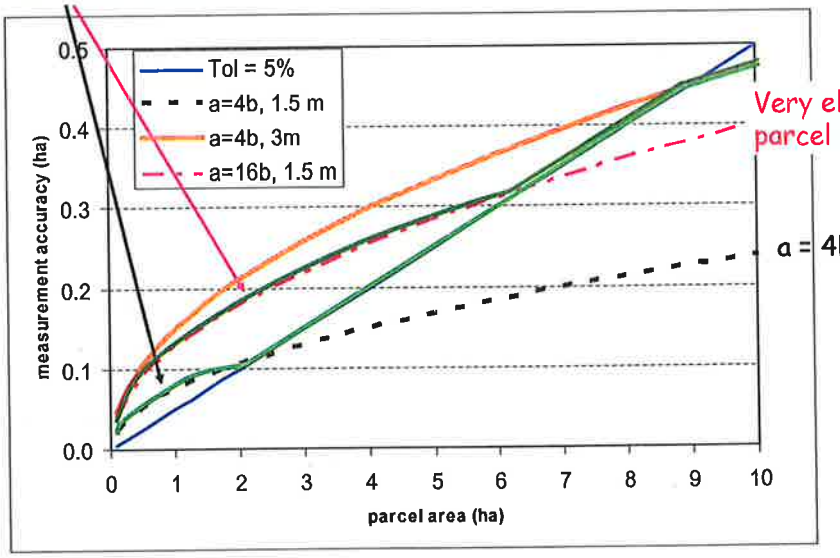
- check if tolerance ≤ 5% of measured area, otherwise ceiling to 5% or 1.5 m buffer



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New checks

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- **Cross compliance: possible use of RS for the control of GAEC**
  - ✓ **Partial control of GAEC related to land use** (e.g. "crop rotation", "no bare soil in winter") -> **detection of parcels to be checked in the field** (in particular outside crop season)
  - ✓ **Aid (risk analysis) for selecting the cross compliance sample**
- **No recommendations on control of nuts in CTS**
  - ✓ Future recommendations in AGRI working document on OTS checks of area (updated doc 2254/2003) - Cf. poster
  - ✓ Feasibility study on GIS nuts to start soon

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Summary of CTS 2005

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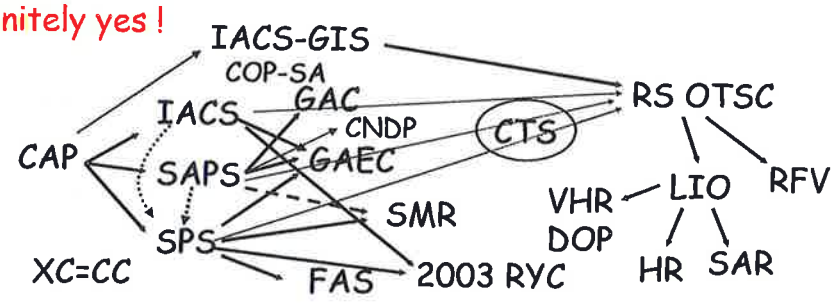
- **Few technical changes for CwRS contractors:**
  - ✓ **Land use & area check still at agricultural parcel level**
  - ✓ **See National Addendum for payment groups**
  - ✓ **New eligibility check(s)**
  - ✓ **cross compliance (partial) RS check as a test**
- **Future towards simplification ?**

Definitely yes !



CTS 2005 / HK

Presentation 2 – Image Provision 2005, CTS Recommendations 1

Pär Johan ÅSTRAND,

JRC, IPSC, Agrifish Unit

Abstract

The presentation will describe the Technical Recommendations for the 2005 Campaign of Remote-Sensing Control of area-based subsidies Part 1: Site selection, Satellite Programming, Image Acquisition and Delivery.

The Recommendations 1 include following changes or updates since the campaign of 2004;

- Includes Annex giving indicative gross area VHR quota for 2005 Campaign
- VHR area increase from 2004, reaching approx 150,000 km2
- Possibility of extra autumn, winter HR image for partial check of cross compliance / GAEC
- Elevation angle by default 60-90 deg.
- EROS/SPOT supermode backup only upon request
- No EROS A data if no proven orthocorrection SW and processing capability
- VHR window preferably 8 weeks
- Radar upon request only; if Spring 1 VHR/HR successful no radar image 2, 3
- QL – also validated QLs sent to contractors
- Cloud Cover (CC) – for HR no change, VHR changes to < 10% on moving frame along strip
- Data return and archiving according to new CTS, and image server metadata
- QL provision to contractor through web browser as alternative to email
- Multiple user allowance to use QB/IK (eg. for eg. LPIS update)
- Chapter on deliverables and deadlines – **deadline for delivery of all sites, and shapefiles 8/12/2004**
- Last years document on site selection and image acquisition (Ref JRC IPSC/G03/P/PAR/par D (2003) (2213) has been suppressed, and content is included in the Recs 1.

Keywords: VHR quota, cross compliance / GAEC, Elevation angle, orthocorrection, moving frame, metadata, web browser

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10th Annual Conference

REMOTE-SENSING CONTROL OF AREA-BASED SUBSIDIES

Budapest, HU, 25-27th of November 2004

Image Provision 2005, and Technical Recommendations 1

"SITE SELECTION, SATELLITE PROGRAMMING, IMAGE ACQUISITION AND DELIVERY"

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Presentation outline

- image provision trend
- new issues in the Technical Recommendations 1, 2005
- VHR areas proposed for 2005 Campaign

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Trend 2003 - 2005

description	2003	2004	2005
HR	124	149	180?
autumn		113	131?
Extra spring			?
radar		49	?
VHR	37	71+	140-150?
	15,000 km2	50,000 km2	145,000 km2
Backup EROS		42	?
Backup SPOT		10 ->17	?

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Technical Recommendations 1

- Chapters with main changes;
  - Site Selection
  - Image Acquisition
  - Deadlines / Deliverables (new)
  - Annex 1 (new)

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Site Selection

- Rules for selecting the zones § 32, Reg. 796/2004
  - two levels of risk analysis: at zone and/or at dossier level
    - suggestion to use IACS GIS to select zone
    - dossiers may be selected
      - all ie. > 80% of declared area inside zone
      - by using risk criteria according to § 27
- Tendency to reduce size of control site
  - increase density of control
  - rate of control within gross site should be 30 %

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Site Selection – piloting cross compliance

- Possibility of extra autumn, winter HR image for partial check of cross compliance / GAEC
  - maintenance of soil cover
  - stubble burning
  - maintenance of grassland, set aside
  - ploughing restrictions
- Use for risk analysis for selecting cross-compliance sample
  - HR classification giving potentially "non" compliant parcels
- MS Administrations should communicate test sites
  - See Deadlines and Deliverables

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Image Acquisition and Image Acquisition Constraints

- HR
  - more windows if piloting cross compliance
    - communicate to JRC by 8/12 (see Deadlines / Deliverables)
  - radar data upon request only
    - 2004; out of the 49 sites provided with SAR data, the images were used only for 9 sites (18%)
    - if Spring 1 VHR/HR successful no radar image 2, 3
      - radar used mainly for winter crop discrimination
  - if > 1 image contractor commits to process imagery

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Image Acquisition and Image Acquisition Constraints

- cont. HR
  - QL; also validated QLs sent to contractors
    - important because often contractor reacted on a "proposed" or "retained" image when a validated was on its way
  - QL provision to contractor through web browser as alternative to email
    - 2006
  - Cloud Cover (CC)
    - no change; 0 , 1-5, 5-20
  - snow cover
    - checking if re-collect possible

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Image Acquisition and Image Acquisition Constraints

- VHR
  - As low elevation angle as possible
    - increased repeat cycle
      - needed in N areas because of cloud
      - needed in S areas because lower repeat cycle
    - e.g. 50 deg. in the UK
      - eg. in UK a 3.3 days repeat cycle for IKONOS for a site of 30x30, 20x40, 20x60km

50 – 55 deg IK, QB

70 deg EROS

⇒ *higher image acquisition success rate*

- importance of ancillary data

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Image Acquisition and Image Acquisition Constraints

- cont. VHR
  - EROS backup only upon request
    - no EROS A data if no proven orthocorrection SW and processing capability
      - SW to correct EROS; PCI Geomatica, SIP ORTHO, Socet Set
    - 2004; 12 contractors received EROS data (26 sites)
      - 4 succeeded to orthorectify
      - rmse > specs
  - SPOT supermode backup only upon request
    - parcel size to fit SPOT supermode

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Image Acquisition and Image Acquisition Constraints

- cont. VHR
  - QB site
    - one date 14km wide, more dates more strips within acquisition window
    - N-S aligned preferred
  - IK site
    - e.g.. one date 30x30km, larger possible
    - N-S aligned preferred
  - VHR acquisition window preferably 8 weeks
    - ⇒ *higher image acquisition success rate*
    - However, it is important to be able to determine crop boundary
  - will close respective spring window if possible

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Image Acquisition and Image Acquisition Constraints

- cont. VHR
  - QL; as in 2004 also validated QLs sent to contractors
  - QL provision to contractor through web browser as alternative to email
    - 2005
  - Cloud Cover (CC)
    - for VHR changes to < 10%
      - on moving frame along strip

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Data return

- Data return and archiving according to new CTS, and image server metadata
  - image return form for HR
  - IDQA for VHR
  - image metadata XML file
  - corrected imagery
  - source imagery

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VHR Image licensing

- Multiple user allowance to use QB/IK VHR data
  - 2 additional Governmental organisations
    - eg. for eg. LPIS update, use in other on-the-spot checks

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Deadlines / Deliverables

- Deliverables and deadlines – **deadline for delivery of all sites, and shapefiles 8/12/2004**
  - C/C (Lat/Long DD WGS84)
  - Windows
    - including extra windows for cross compliance
    - Autumn windows and sites should already have been handled to us...(131 sites...)
  - Vector shape files (max 500 vertices...)
  - Radar ?
  - EROS ?
  - SPOT ?
    - JRC need to perform feasibility in January 2005

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Documents

- Last years document on site selection and image acquisition (Ref JRC IPSC/G03/P/PAR/par D (2003) (2213) has been suppressed, and content is included in the Recs 1.
- CwRS VHR Campaign 2005 Image Acquisition / Validation / Ordering (Ref JRC IPSC/G03/P/PAR/par D(2004)(2553_2005) is presently being edited and will be available
- see website
  - http://agrifish.jrc.it/marspac/CwRS/default.htm

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Annex 1

- Recs 1 includes Annex giving indicative gross area VHR quota for 2005 Campaign
  - quota calculated based on CwRS applications in 2004
  - mean size of CwRS application
  - ⇒ *area controlled by RS by each MS*
  - technically feasible / budget area pro-rata distributed
    - some ceilings applied eg. DE, FR, UK
    - some areas specifically asked for eg. GR, LUX, EE, LV, CZ, SK, SI etc.

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Annex 1

- VHR area increase from 2004, reaching approx 140,000-150,000 km2
  - 140 – 150 sites
  - ratio Ikonos / Quickbird 3:1
  - place a priority on site (1-3)
- Limit is at present technical not economical – test feasibilities ongoing (UK, IE, BE, FR)
  - limit IK approx 110 – 120,000 km2
  - limit QB approx 30 – 40,000 km2
  - limit EROS approx 15 - 20,000 km2
  - limit SPOT approx 30 – 35 scenes (depending on HR)

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Annex 1 - proposed VHR area and VHR sites 2005

MS	VHR area proposed		
AUSTRIA	0	0	0
BELGIUM - Wallonia	2,700	4	675
BELGIUM - Flanders	1,000	2	500
GERMANY	18,000	15	1200
DENMARK	7,500	4	1875
SPAIN - TRAGSATEC	20,000	10	2000
SPAIN - DAP	1,200	3	400
FINLAND	1,000	1	1000
FRANCE	22,500	25	900
GREECE	1,800	3	600
IRELAND	7200	12	600
ITALY	10,000	4	2500
LUXEMBOURG	900	1	900
NETHERLANDS	1,600	1	1700
PORTUGAL	0	0	0
SWEDEN	5,700	7	814
UNITED KINGDOM	12,000	10	1200

MS	VHR area proposed		
ESTONIA	1,000	3	333
LATVIA	1,200	3	400
LITUANIA	2,200	4	550
POLAND	5,500	10	550
HUNGARY	9,900	9	1100
CZECH rep	3,600	4	900
SLOVAKIA	3,600	3	1200
SLOVENIA	1,000	1	1000
MALTA	400	1	400
CYPRUS	300	2	150
EU 25 2005	141,900	142	

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- Thank you !

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Presentation 3 – Image Server – An Application for Archiving CwRS Imagery

Armin BURGER,
JRC, IPSC, Agrifish Unit

Abstract

The MARS PAC ImageServer is an online archive for satellite images out of CwRS campaigns hosted at JRC. It offers the possibility to search for images via attribute (acquisition year, satellite type, etc) and spatial filters via a web interface. The images found can be directly visualized on-screen and loaded via various protocols into GIS or image processing software and also into office applications. The raw images can be downloaded for further processing and analysis. The system is set up as a framework of disk storage, map server, spatial database and image web server and offers access to currently about 6000 satellite images.

The VHR Browser will be set up as a system for browsing and viewing the VHR quicklooks. It allows image providers to upload quicklooks of their image acquisitions and enables the national contractors to immediately browse and visualize the provided quicklooks. This way the system intends to substitute the current email distribution system of VHR quicklooks.

Keywords: online archive, image server, image metadata, WebGIS, VHR, quicklooks

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ImageServer
a framework for archiving CwRS imagery

VHR Browser
an application for accessing VHR acqusition quicklooks

Armin Burger

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ImageServer - Reasons for archiving imagery

- Since 93, DG AGRI has purchased a huge amount of satellite imagery for the CwRS and 'Activity B'
- MARS project was requested to archive these data
  - As an administrative proof of purchase ("inventory", financial Audit)
  - But also to avoid purchasing the data twice (other use internal to the Commission and IACS Administration)

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The different types of archive systems…

The easiest …

… and the worst !

ImageServer/VHR Browser, Armin Burger

10th Annual CwRS Conference, November 2004, Budapest, HU

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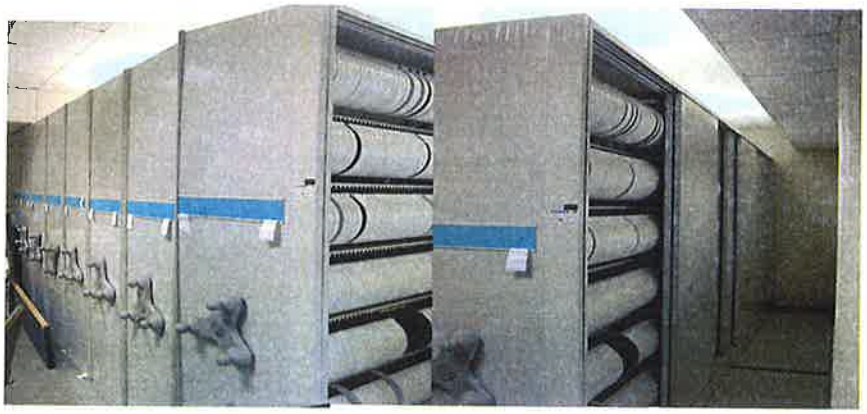
Image archiving evolution: 1985-95

A full room to store CCT tapes



ImageServer/VHR Browser, Armin Burger

10th Annual CwRS Conference, November 2004, Budapest, HU

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Image archiving evolution: 2000

A cupboard to store CDs /DVD

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Status of image archive beginning 2004

- Amount of data collected so far:
  - From "Activity B" (MARS Stat application) ~1000 CD-ROM's & ~800 DAT/Exabyte tapes
  - From CwRS (MARS PAC): ~ 5000 CD-ROM's
  - Status 03/2004: > 8000 images, > 20 Mio Euro
- Future trends (CwRS): enlargement, VHR
  - Smaller & more numerous sites, more expensive imagery
  - 2004: CWRS : 3.7 Mio Euro
  - 2005 … CwRS: 5-6 Mio euro / year …

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Status of image archive beginning 2004 (2)

- Images on CD's (and tapes) difficult to access
- Basic localization system, mainly without previews/quick-looks, no search functions
- Plenty of combinations (~ 100) of satellites, sensors and processing levels
- No pre-processing (raw data, not georeferenced)
- CD-ROM's have a limited lifetime

So where do we go from here?

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Moving to an on-line archive – ImageServer

Objectives

- Set up an on-line archive and catalogue system for MARS PAC image collection
- Facilitate access to images
  - accessible via Web
  - image search with attribute and spatial filters
  - fast image preview
  - load compressed (ECW) or original image from storage area

Identify, view and get the images you are looking for

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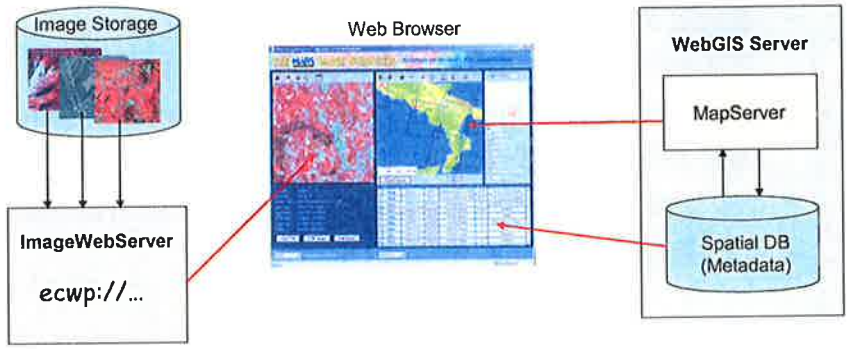
ImageBrowser – a Web application to find images provided by ImageServer system



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ImageServer – current status Nov 04

Achieved so far

- 95 % of CD-ROM's loaded
- 80 % of images processed and available via ImageBrowser
- ~ 6000 satellite images available

Still to be done until early 2005

- processing remaining images, load 2004 images
- add additional functionalities for ImageBrowser, with regard to user requirements
- set up user authentication system

Future Enhancements

Full implementation of OGC protocols/interfaces (Catalog Service, WMS, WCS)

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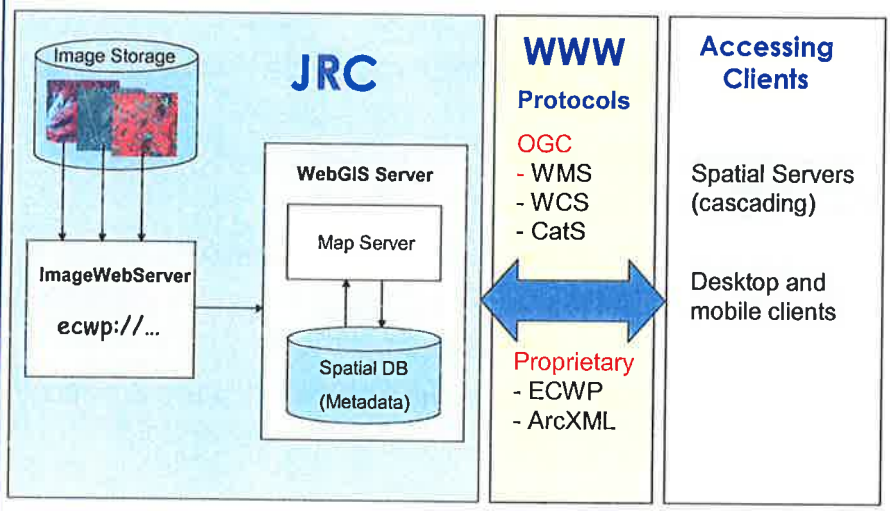
ImageServer and possible services



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VHR Browser – accessing VHR acqusition quicklooks

Objectives

- Allow image providers to upload quicklooks of their image acqusitions
- Allow contractors to immediately browse and visualize the quicklooks
- Substitution of current email distribution system

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A first prototype 2004

- Data – quicklooks and shapefiles – still received via mail
- Preparation of data in ArcView, separated by control site
- Export ArcView settings into database
- Read database from a WebGIS system and create image and vector layers on-the-fly
- Quicklooks available via intranet of the commission

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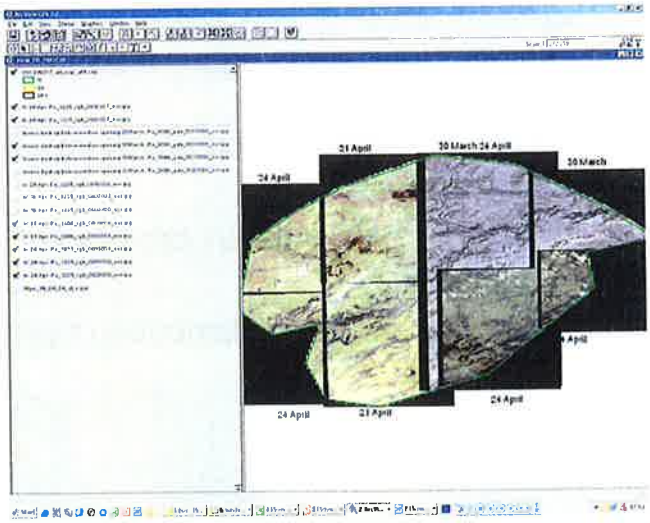
From ArcView…



ImageServer/VHR Browser, Armin Burger 10th Annual CwRS Conference, November 2004, Budapest, HU

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… to database…

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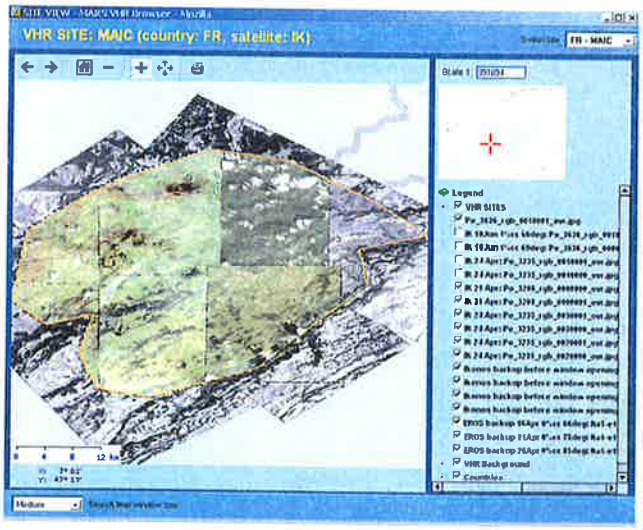
… to WebGIS



ImageServer/VHR Browser, Armin Burger

10th Annual CwRS Conference, November 2004, Budapest, HU

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Future workflow

- Web interface for image providers to upload data (quicklooks, vector data, metadata XML) and define the layers per site
- User authentication for accessing site settings
- Settings stored in database; can be modified by image providers; supervised by JRC
- Database settings read by WebGIS and layers created on-the-fly
- Direct control of results (and possibly modifications) by image providers
- Contractors can access and browse quicklooks for 'their' sites
- System scheduled to be in production beginning January 2005

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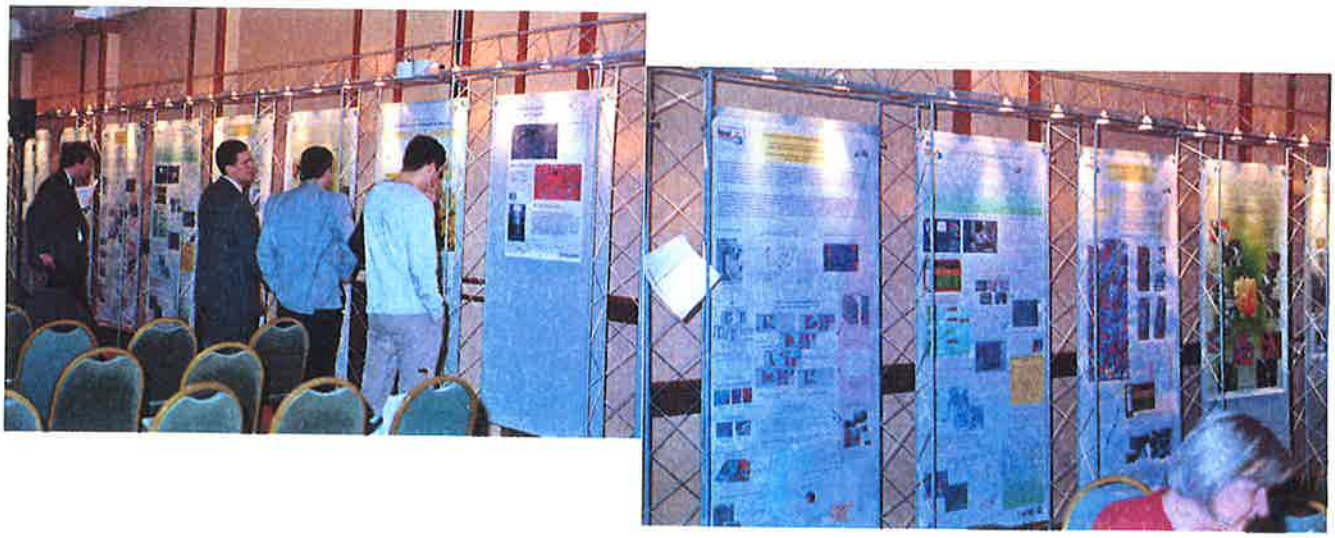
Thank you for your attention

ImageServer/VHR Browser, Armin Burger 10th Annual CwRS Conference, November 2004, Budapest, HU

Posters (abstracts)



1. An indicator approach for the assessment of environmental performance of intensive arable crop production at different scales using hyperspectral technologies

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This paper presents a case study for the application of hyperspectral technologies in different scales in the context of environmental performance assessment of arable crop production.

In order to evaluate the suitability of different remote sensing methods satellite, aerial hyper and multispectral images, as well as multispectral digital camera images were compared. Hyperspectral records were obtained by a new 79-channeled aerial camera/DAIS 7915/, as well as LANDSAT, SPOT and MODIS images, completed with data of the TETRACAM ADC wide band multispectral camera.

In order to estimate the influence of crop production following the concept of DPSIR model (EUROSTAT) an indicator framework were established for environmental media soil, as well as environmental systems such as ecosystems and landscape.

The range of works covers the collection baseline data regarding to the actual environmental state of the studied area, such as production of overview maps on soil types, existing habitats, natural and semi-natural vegetation, land use patterns, ecological frameworks.

Furthermore the role and suitability of agri-environmental indicators and multispectral data in investigating of the environmental performance of the arable farm practice are discussed.

Future goals are to relate to establishing an economically and ecologically effective indicator framework using hyperspectral technologies for evaluating environmental issues to provide an objective, scientifically sound indicator framework as a basis of the monitoring progress on sustainable development in the agriculture.

2. Technical aspects regarding the use of aerial and satellite VHR data for non-structured landscape cases

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The pilot project for the setup of Land Parcel Identification System in Romania (AO N° G03/11/03) realized by GEOSYS-FR, CRUTA and INTERGIS-RO offered the possibility to test VHR satellite images, aerial orthophotos and auxiliary cartographic data (cadastral redistribution maps at different scales). The arduous situation of the procurement of basic data (classified geodetic and cartographic information), the inconsistency of coordinate transformation algorithm of the available professional software generated an important delay for the preparation phase. Relevant conclusions are now available and the administration has the possibility to start evaluation studies for the cost and human resources estimation in view of the Romanian LPIS implementation.

Comparisons between the use of different DTMs for the orthorectification process, as well as the study concerning the digitization of physical blocks (as recommended solution for Romania) are presented. Independent operators created blocks and the resulted vectors become the subject of a detailed analysis concerning the interpreter's approach and productivity. The basic interpretation support was constituted by Quick Bird imagery and, for one site, aerial orthophotos (pixel size 0,5m). Considerations regarding the quality of the photogrammetric material are also presented.

Keywords: LPIS, remote sensing, physical blocks

3. The comparison of crops identification on ENVISAT / ASAR and SPOT XS time series. (Malbork test area).

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The results of the ENVISAT-AO ID:783 Project will be presented. The project concerns the use of ENVISAT/ASAR data acquired in Image Mode and Alternating Polarization Mode with different viewing angles and polarization configurations for land cover mapping and agricultural crops identification. The 27 different ASAR images taken during "Summer 2003" campaign over a very flat, typically agricultural "Malbork" test area in the northern Poland have been geometrically corrected, speckle filtered and calibrated. Many field visits for collecting ground truth data like: land cover / crop check, identification of developing stage of vegetation, soil moisture and plant water content for some of crops / parcels measurements, taking photographs of parcel and plants, have been carried out.
In the context of sensors' fusion synergism and their complementarity a time series of five SPOT XS/XI registrations were programmed. The catalogue of signatures (spectral features expressed in the form of color compositions) for many parcels representing main land cover types and the major types of crops found in the AOI has been established for each optical registration. Similar catalogue has been also done for ASAR images and their compositions, completed with the values of Sigma Nought as an objective quantitative parameter. The main aim of the data processing was to produce the thematic map of land cover and crops. The results of crops identification on the ASAR time series and automatic classification results will be presented. The comparison with the results achieved using SPOT images will be shown as well.

Keywords: crops mapping, SPOT , ENVISAT / ASAR

4. Automated Monitoring of Landscape Elements – Contribution to Cross Compliance Requirements

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Introduction

In the course of the ongoing CAP reform, the compliance of further obligations (**Cross Compliance**) is mandatory for the reception of direct support to farmers. Certain landscape elements have to be conserved and may not be eliminated according to article 5 and annex IV of the Council Regulation (EC) No 1782/2003. In preparation of the request for their registration and monitoring the State Agency for Nature and Environment of Schleswig-Holstein (LANU) mandated EFTAS to execute a digital surveying of landscape elements in pilot areas and to draft an expert report regarding necessary efforts and the recommendation of modern and efficient techniques.

Execution

Based on different digital aerial photo data and available vector data three different methods were used simultaneously:

- Manual on screen digitisation
- Automated vector generation
- Semiautomatic object-oriented raster classification

Effort and precision were compared and analysed for all methods used. Additionally the combination of these methods into one general approach was tested.

Results

The highest accuracy was realised with the manual approach, but needing the highest effort. Regarding to the automated vector generation it has to be admitted, that besides the high attribution accuracy also a lower geometric delineation was reached. Using additionally high resolution stereo data for object-oriented classification precise delineation was realized but only with lower attribution accuracy. The development of a semiautomatic combined approach has lead to a better level of results, avoiding most of the disadvantages of the stand alone methods: The manual efforts were reduced considerably but the attribution of landscape elements reached nearly the same level of confidence as in the manual interpretation. In conclusion the further fine-tuning of this pilot approach may offer not only for Schleswig-Holstein new potentials for cost effective fulfilment of requirements for habitat monitoring and cross compliance.

Keywords: Cross Compliance, landscape elements, automated and semi automated image analysis, object oriented classification, Airborne Digital Sensor, High Resolution Stereo Camera

Table 1: Special traditional landscape features manually, automatically and semi-automatically interpreted in Schleswig-Holstein

- hedgerow (Knick) - solitary tree
- tree row, avenue
- natural group of trees - boundary ridge, field margin
- river, stream
- pool, pond and water spot - interstitial ice hole - riparian vegetation - reed marsh and flood plain
- fen, moor - bogs and mires - rush and sedge dominated meadow - spring area - halophytic inland habitat
- dry meadows
- inshore dune
- ditch, drainage pattern (Grüppen)

5. The VHR data region-based classification possibility in the framework of the Control with Remote Sensing of the European CAP

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In the European CAP (Common Agriculture Policy) framework, the European Commission impose on member states to prevent agricultural subsidy irregularities with remote sensing. The agricultural land cover is checked with multi-temporal images and may be made through automatic classification and/or photo-interpretation on the screen. It is obvious that an automatic classification is preferable in point of view time-consuming in the control process. The European Commission, by the way of his Joint Research Centre, advises the use of very high spatial resolution (VHR) satellite data in the control process. The use of these kind of data involves some problems in the traditional per-pixel classification like the salt and pepper effect, the poor spectral resolution of the VHR data and the difficulty in classifying land use. The region-based classification could solve these problem and allows the use of other features on top of spectral features. Moreover, the first step of the region-based classification is the segmentation and it could be useful to do or up-date the Land Parcel Identification System (LPIS). This study present the possibility of the VHR data region-based classification to the classification of the agricultural and rural land cover in the framework of the remote sensing control of the European CAP.

Keywords: very high spatial resolution satellite data, region-based classification, land use/cover

6. Quickbird data fusion 0,6m: the highest resolution for larger scale agricultural applications

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The use of Satellite VHR data in RS subsidy controls is continuously expanding. Its higher resolution, in addition of its spectral and radiometric capability, allows an efficient subsidy control over selected areas. Priority tasking also permits to select differentiated dates of acquisition according to local crop presence and phenological phases.
The two presented posters show two possible uses in agriculture. The first is a Quickbird pansharpened 0,6 m false colour band 432 over Campobasso an Italian CwRS site 2004 (Molise Region, centre of Italy). Several official cadastral maps (original scale 1:2,000) are overlaid, after the proper image ortho-rectification session. The multispectral data enables the crop detection, not only for the different spectral signature, but also for the different texture due to the agronomic context and man made features. The second represents a detection of permanent crops. The South Sicily Quickbird pansharpened 432 0,6m image (Siracusa province- Avola) shows single crown trees detection and distinction, both due to different spectral signs and typical geometrical features (olives, almonds, etc). The new nut declaration controls activity (reg.1783/2003) and the next mandatory Nut Register at national level can find in Quickbird a valid ally.

Keywords: VHR, Quickbird, cadastral maps; Nuts

7. Towards the Land Parcel Identification System for the Czech Republic 1999 - 2004 – presentation of the book

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The book introduces new Land Parcel Identification System (LPIS) which has been created by the company Ekotoxa Opava for the Czech Ministry of Agriculture. The system was created using digital aerial orthophoto maps as a basic source. Farmers were directly involved into the creation process. Czech LPIS consists of about 570 000 farmer blocks.

The book covers all major topics related to the creation of the Czech LPIS, e.g.:

- Description of LPIS geographic database
- Results of the pilot project in 1999
- Methodology used during creation of the Czech LPIS (2000 - 2002)
- Resulting statistics of the geodatabase
- Results of spatial analyses using external geodata (e.g. digital terrain model, soil-ecological data or specially protected areas)
- Testing of the control with remote sensing
- Database updating in 2003
- In-house developed software application for remote access and LPIS data updating
- Using LPIS for administration of national top-up's in the beginning of 2004

The book is bi-lingual (Czech - English) with many colour photographs, tables, graphs and maps. Free copy of the book is available for each conference participant.

Keywords: Land Parcel Identification System, LPIS, Czech Republic

8. From LPIS creation (2002-2003), Pilot Project on CwRS towards operational CwRS use in Slovak Republic

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The 2004 campaign is based on Common Technical Specification for ITT no. 2003/S 234-208161 "Remote-sensing control of arable and forage land area-based subsidies" (4. December 2003) and is based on agreement of delegated activities between APA SR and SSCRI.

The CwRS in Slovak republic is divided into two schemes:

- control of SAPS (thresholds - area max. tolerance 3%, partly GAEC)
- control of National Top-up (thresholds - area max. tolerances 3 % and, or 2 ha, crop – subsidised P and non subsidised X)

Campaign of declaration process started on 14th of April 2004. Deadline for submitting applications was set up on 15th of May 2004. Farmer declaration consists of two parts:

- Application form (divided into two sections,-SAPS and Top-up)
- Graphical enclosure (pre-printed orthophotomaps with LPIS)

CwRS was carrying out by SSCRI on two sites:

Site 1 (PODU - HR + panchromatic SPOT5 2.5 m + ARCHIVE AERIAL ORTHOPHOTOS + RFV) is represented by circle with 25 km radius and site 2 (VRAN VHR-IKONOS + HR + ARCHIVE AERIAL ORTHOPHOTOS + RFV) by square covering area of 20 x 20 km. In 2004 campaign 786 applications were controlled (6.4. %), on site 1 (PODU) 675 applications (5.4 %) and on site 2 (VRAN) 111 (1.0 %) applications. According to the time table based on agreement of delegated activities between APA SR and SSCRI all dossiers were forwarding to Slovak APA after categorisation at parcel, crop group and dossier level.

Keywords: Common Technical Specification for CwRS 2003, SSCRI, SAPS, Top-ups

9. Determining Olive Growing Areas and Establishing Olive Database of Balıkesir-Burhaniye in Turkey

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[2] AGRIFISH (ex-MARS) Unit, Institute for the Protection and Security of the Citizen, European Commission, JRC, TP 266, Joint Research Centre, 21020 ISPRA (VA) ITALIA

This ongoing pilot project on the implementation of a GIS-based registry on olive groves and olive trees in the Burhaniye county of Balıkesir province of Turkey (TR) is a partnership between the AGRIFISH Unit of Joint Research Institute (JRC) of European Union (EU) and the Geographic Information Systems (GIS) and Remote Sensing (RS) Department of the General Directorate of Agricultural Research (GDAR) of Turkish Ministry of Agriculture and Rural Affairs (MARA).

The AGRIFISH contribution was financed as part of the MARS-PECO project of the JRC. Very high resolution (VHR) satellite (Quickbird) imagery over the area of interest has been acquired on 4th June 2004 by the JRC and represented the main source of RS data for the identification and registration of Olive Groves and Olive Trees. Technical support about the ortho-rectification of the acquired VHR imagery, the establishment of the functional structure of a OLI-GIS system, and the installation and use of the OLICOUNT software package (semi-automatic counting of olive trees) was provided by the team of AGRIFISH Unit.

Necessary field data for ground control points (GCP), digital cadastral maps, and digital elevation model (DEM) of the study area were produced by GIS and RS Department of GDAR. At the end of this pilot project, a database that contains olive groves and number of olive trees will be produced in parcel basis for the year 2004.

Key Words: Land registry, olive, OLIGIS, OLICOUNT, remote sensing

10. Assessing the use of low elevation angle imagery and multiple image blocks with reduced ground control

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Two constraints in the use of VHR imagery for IACS control with remote sensing are: increase in the number of imaging opportunities to gather large control zones, and the increase in ground control requirements. Two solutions to these problems have been tested by the JRC during 2004, which are the subject of this presentation.

First, a study was defined using a predefined set of elevation angles for a site in southern France; imagery was acquired using Ikonos, QuickBird and Eros 1a sensors. It was concluded that for the first two sensors, elevation angles down to 60° could be used, assuming other certain conditions for ancillary data were respected.

Second, repeat processing of control zones in Italy, Ireland and Cyprus, where blocks of between 9 and 12 images were acquired, has shown that it is feasible to reduce ground control requirements to between 6 and 10 points per zone (i.e., ~1 point per image scene) and obtain orthoimages of a quality suitable for IACS operations. It was also demonstrated that in certain conditions, the block procedure with *no ground control used* produced results showing a clear improvement of the geometric uncertainty of single images, resulting in an orthoimage with a quality at the limit of acceptance for the control with remote sensing programme.

Keywords: Ikonos, QuickBird, Eros, block adjustment, ground control, elevation angle

11. An independent evaluation of the SPOT Image Référénce3D digital elevation model and orthoimage products

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The widespread availability of good quality digital elevation data opens the door to systematic and improved automation of orthoimage production, in the context of the IACS and the control with remote sensing activity. Best practice for production of VHR (<1m pixel imagery) meeting IACS requirements usually states a quality of 5m $RMSE_z$ is required.

During 2004, two sources have emerged: the "opensource" SRTM C-band (3 arc-sec, approx. 90m grid size) data, released to the general public via the internet and requiring careful processing, and SPOT Image's commercial Référénce3D product, which is created using the stereo HRS sensor on the SPOT5 platform. Both data sources have official general specifications somewhat lower than the 5m $RMSE_z$, but given the usually limited relief in agricultural areas, an investigation into the quality of these datasets was considered an important task.

This presentation will report on the test carried out by the JRC and FÖMI to determine the suitability of the SPOT Image Référénce3D product covering a single production tile (approx 10,000km2) in Hungary. The quality assessment methodology was developed at the JRC, and executed using comparison data available in Hungary by FÖMI. The results show that the Référénce3D for the tile tested performed better than its standard specification, and is suitable for rectification of most VHR imagery in the context of IACS without further processing, besides projection and datum transformations.

Keywords: DEM, elevation, datum transformation, Référénce3D

12. An independent evaluation of the SPOT Image Référénce3D digital elevation model and orthoimage products

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Keywords: DEM, elevation, datum transformation, Référénce3D

13. Implementation of the new area based aid for the Nuts sector

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Since 1992 the role of Remote Sensing and geomatics in the management and control of the Common Agricultural Policy became more and more important. These techniques are used operationally for major projects for which the JRC plays an important role, from the implementation of Land Parcel Identification System to the yearly Control with Remote Sensing activities. It covers not only arable lands and forage, but also permanent crops with the implementation of Olive GIS, vineyard registers and more recently the extension of these activities to the nuts sector.

A new area-based Nuts scheme was recently introduced (Reg. 1782/2003 and Reg. (EC) 2237/2003), covering about 800,000 ha of Nuts throughout EU, including almonds, hazelnuts, walnuts, pistachios and locust beans. This new regulation is quite complex because there are eligibility conditions based on parcel area, density of trees per ha (variable according to nuts species) and limitation of mixed crops. It is compulsory for the member states to set up an additional GIS layer for Nuts [within the LPIS] with the number of trees per parcel, their type, their position and the calculation of orchard's surface. This new regulation requires a clear definition of entities (nuts orchards, trees) and rules, common for all Member States. Some questions such as: how to define an orchard, how to define a single tree, a single row, how to position the orchard's boundaries, how to separate species and how to count trees, are crucial. They are being discussed between the Commission and the Member States. During the 2004 campaign some member states have already undertaken control of nuts parcels; the JRC organised a workshop on the Nuts scheme in July 2004 and launched a feasibility study for a Nuts GIS. A number of informations on nuts growing were already collected. This paper presents an overview of the status of the work so far and future development of activities for the Nuts sector.

Keywords: Remote Sensing, Nuts, Tree counting, Parcel area measurement, CAP reform, Coupling

14. POLYCOUNT: Polyvalent counting of fruit trees using VHR imagery

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Regarding support to the Common Agricultural Policy the JRC was particularly active in the olive sector with two statistical studies (1997 –1998) called OLISTAT (estimation of the number of olive trees in UE) and OLIAREA (estimation of olive area), and then for the implementation of the Olive GIS in which all olive parcels (10 M) and olive trees (600 M) throughout the UE were positioned. In order to carry out these statistical studies, the JRC designed an automatic counting tool called OLICOUNT, to count olive trees on the basis of aerial photos (Simon Kay, Steve Peedel, 1998). The objective of this tool was to reduce as much as possible the photo-interpretation and the field work workload. OLICOUNT is based on a rather simple approach combining a threshold of radiometric values and morphological criteria. The advantage of this tool is that it is quite simple and robust and it can be used on various regions and various types of olive groves. However due to the pixel resolution of images used so far (orthophotos at 1m resolution pixel), the software was efficient for large, regular olive parcels with mature and well separated trees but did not work well for small, irregular parcels with young trees, or in case of 'complex' olive groves (associated crops, badly-maintained olive grove, olive trees mixed with other species etc). In addition OLICOUNT had some constraints:

- it was only used with 1m resolution orthophotos (which was the type of data specified by the Commission for the OLISTAT/OLIAERA and OLIGIS projects). It had never been tested with VHR images.
- it only works with Panchro images (i.e. grey level, 8-bit images). The new VHR images (Ikonos, Quickbird) which are coded on 16 bits pixel could not be handled.
- it supports only TIFF raw format (Geotiff format is not supported).
- it was never tested for counting other species of fruit trees.
- It was not maintained since 1998 and when migrating from Windows NT to Windows XP it did not work anymore.
- it was developed in C++ and Avenue language and it can be run only on Arcview 3.x platform.

With the recent development of the CAP (recent introduction of a new area aid for Nuts, integration of citrus register), the improvement of OLICOUNT results using the new VHR images becomes an important issue. That is why the JRC launched an Exploratory Research study and a series of tests of fruit trees automatic counting using VHR images. One of the first tasks of the Exploratory Research was the investigation of other approaches than OLICOUNT in order to identify methods, which could improve the results and which could be more automatic than OLICOUNT. OLICOUNT was upgraded to handle VHR imagery. A series of tests using various methods of fruit tree recognition and various types of images (the current 1m orthophotos, Ikonos, Quickbird, and orthophotos from ADS40 digital camera at 0.5m) were undertaken on large set of data, including olive trees and other fruit speciesWith the new VHR images and the new version of the software the identification of olive trees was improved and the identification of other fruit trees was also successful. This paper presents a summary of results of automatic counting using OLICOUNT, compared with two other automatic tree counting, the first one is CRISP (tested on citrus) and the second one is based on regional minima.

Keywords: Remote Sensing, Olive trees, Nuts, Fruit Trees, Individual Tree counting

15. IRS Resourcesat – 1, IRS-P6

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The IRS Resourcesat-1 (IRS-P6) was successfully launched into sun synchronous orbit on October 17, 2003 and has a mission live time of five years. It ensures the data continuity of the IRS-1C and IRS-1D. IRS-P6 data are acquired by a world wide network of groundstations whereas the station in India is operational. The reception of IRS-P6 data in Neustrelitz was started and will be operational soon. The next additions to the operational network will be the stations in Oklahoma, Alaska and China. A solid state recorder on bord the IRS-P6 even makes a global coverage possible.

Their unique combination of swath, radiometric-, spatial- and timely resolution makes the IRS-P6 sensors suitable to cover user requirements in a wide field of applications ranging from high to medium resolution, e. g. land management, telecommunications, transportation, forestry, natural hazards, agriculture, environmental, insurense, national/global security, exploration and recourses, mapping, planning, utilities and media.

The IRS-P6 has three improved multispectral cameras to provide an up to date remote sensing data service for mapping, acreage estimation, forestry and disaster management.

- · **Spatial Resolution** was improved for LISS-III and AWiFS
- · **Radiometric Resolution** was enhanced for LISS-IV and AWiFS sensors
- · **Flexibility** to switch between LISS-IV Mono and multispectral (MX) mode
- · **Shorter Revisit Time** for high resolution multispectral data

Keywords:

- Three improved multispectral cameras
- Data continuity to IRS-1C and IRS-1D missions
- Global coverage through solid state recorder
- World wide groundstations network

16. High resolution digital airborne sensor DMC and it's use for agriculture monitoring

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With the introduction of the digital aerial cameras, a new generation of high resolution multispectral sensors became available. The Z/I Imaging DMC Digital Mapping Camera is a CCD frame based camera, which can be used to acquire image data for mapping and remote sensing application during one flight mission. The spectral sensitivity range is from 450 to 900 nm, the spatial resolution can address a wide range of application from large scales for cadastral purposes to small scales for thematic mapping or classification of vegetation, like agriculture monitoring.

The images acquired with the DMC have a central perspective and thus can be processed with any standard softcopy system. Because of the 12Bit pixel depth per band, the radiometric quality is outstanding. The high resolution colour images are generated by using a PAN sharpening technique.

Small scale image examples acquired with the DMC in RGB and CIR are shown. The basic design principle of the DMC will be explained.

Keywords: airborne sensor; high resolution; multispectral sensor; digital camera

17. Global monitoring for Environmental Security (GMES)

No abstract

18. The usability of VHR satellite images for IACS purpose in Polish conditions.

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The geometric quality of the VHR satellite images and their orthorectified products is quite high as it is confirmed by practical tests and experience collected also during the control with Remote Sensing campaign in the frame of IACS. These products are also considered as a good source of thematic information, especially the ones based on multispectral images including their pan-sharpened variant. Such properties give the promising perspectives in wider using of the VHR images.

The spatial agricultural structure in some regions of Poland is quite complex. The occurrence of narrow and elongated parcels is typical case. It is very interesting question how far the VHR satellite images can be useable in such reality in the context of the IACS control needs.

The poster presents the preliminary results of the research project ongoing in the Institute of Photogrammetry and Cartography (Warsaw University of Technology). With regard to the subject and results planned to be achieved, the Project is carrying on with the cooperation with the Agency of Restructuring and Modernising of Agriculture.

The aim of the Project is to develop the effective approaches and methods of VHR satellite image processing adaptable to the spatial complexity of Polish agriculture landscape. Due to the IACS control tasks and needs the identification of land cover and land use elements is the key issue.

The review of the results included in the poster confirms a good geometric quality of the tested images and their consistency with cadastre. It shows also the potential usefulness of VHR images from thematic content point of view.

Keywords: VHR images, land cover, land use, classification, IACS

19. Handling of vis maior claims in LPIS in Hungary - the Flood of river Hernád

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In the beginning of August, 2004 flood hit the areas along river Hernád, in the northern part of Hungary. The flood did not endanger human lives, but damaged mainly agricultural areas. The Ministry of Agriculture and Rural Development (MARD) has ordered the Institute of Geodesy, Cartography and Remote Sensing (FÖMI) to map and properly assess the damages caused by the flood. The famers cultivating their land in physical blocks over the damaged areas, are subject to vis maior treatment, without further request.

The Remote Sensing Centre of FÖMI (FÖMI RSC) mapped the damaged areas with a time series of different high resolution satellite images (Landsat TM, IRS LISS) between 22nd of July and 16th of August, 2004. The inundation was mapped properly, taking into account the direct and indirect effects of flooding.

Several physical blocks have also been controlled by field inspections as a quality control of remote sensing based decisions. The result of the mapping and damage assessment was the list of physical blocks affected by the flood, which will be published in a MARD decree.

Keywords: LPIS, vis maior, flood detection, remote sensing

20. LPIS-Hu (MePAR) and its applications in Hungary

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The building up and the maintenance the Integrated Administrative and Control System (IACS) is still a key issue in the New Member States, one of its main components is the Land Parcel Identification System (LPIS). In Hungary the Institute of Geodesy, Cartography and Remote Sensing (FÖMI) built the Land Parcel Identification System during 2002 and 2003. Since 2004 FÖMI has been carrying out the maintenance of the LPIS as a delegated task, under the MARD-ARDA-FÖMI delegation contract. The system is based on physical blocks with natural boundaries, which was found to fit the best to the country's agricultural utilization characteristics. The source data used in LPIS building were ortho-photos (mainly from year 2000, partially from 2003), topographic maps, and high resolution satellite image data series between 2000 and 2003.

Creation of the LPIS database started in October 2002, and was finished in 2003. LPIS-Hu has core data (ortophotography, block boundaries, id numbers, areas and cadastre) and other layers (Less Favoured Areas, Environmentally Sensitive Areas etc) all in GIS. About 300 000 physical blocks cover the entire area of Hungary. The average size of the blocks is about 32 hectares, including all land cover categories and 28 hectares excluding forests. There are around 250 000 blocks which contain any areas eligible for SAPS payments. Based on the CwRS sample, on average 3,3 farmes cultivate one block and there are 4,7 parcels in a block.

There were more than 1 million block mapsheets printed for farmers as a graphical annex to the applications (including those for LFA). Farmers' drawings of parcel boundaries have been digitized and controlled in the sample of Control with Remote Sensing programme. Less favoured Areas (LFA) and Agri-Environmental Measures (AEM) have also been inserted as layers of LPIS-Hu.

FÖMI RSC developed a web browser applicaton for the officers of involved authorities (ARDA, Chamber of Agriculture, integrators of joint cultivation etc.) for helping the applications through the Internet of farmers with parcels spread around different comunes. FÖMI has also maintained a free telephone hotline for problems occuring during the submission of applications.

Keywords: LPIS, physical blocks, Internet-browser, LFA, AEM

21. Control of area-based Subsidies in Hungary in 2004

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Since 2000, the Institute of Geodesy, Cartography and Remote Sensing (FÖMI) has carried out a program for the control of area based subsidies with remote sensing, to the Ministry of Agriculture and Rural Development (MARD) in Hungary. Since 2004, FÖMI - via its Remote Sensing Centre (FÖMI RSC) - carries out the CwRS program as a delegated duty, under the MARD-ARDA-FÖMI delegation contract. The CwRS program covered 9 counties in 2000 and 2001, since 2002 it covers whole Hungary.

In 2004 the subsidies have been controlled under EU regulations (different crop groups for SAPS and top-ups, special controls for the Good Agricultural and Environmental Conditions). In 2004 the total number of dossiers was around 208 000 in Hungary, the number of dossiers controlled with remote sensing is more than 8600. Due to the large number of claims 80 % of the control sample have been checked by remote sensing. There were 9 sites, all covered by VHR data (5 with IKONOS, 4 with QuickBird images). Six sites' VHR data have been financed by the European Commission (DG AGRI). The total area controlled was approximately 200 000 hectares, with 15 000 physical blocks. There were around 40 000 agricultural parcels to control, on average 4,6 parcels/farmer and 23,1 hectare/claim. Three conditions for the Good Agricultural and Environmental Conditions (GAEC) have also been controlled by remote sensing. The results of control have been submitted to the Agricultural and Rural Development Agency (ARDA) in regular reports.

The CAPI software for interpretation was developed by FÖMI, and it has been adjusted to the annual conditions of the regulations of subsidy schemes. More than 1 million individual block mapsheets have been delivered for the farmers (as an annex for the application), where they were expected to indicate the agricultural parcels they cultivate. Their drawings of parcel boundaries have been digitized and controlled by CAPI and stored in GIS. Statistics will be presented in detail on the poster.

Keywords: CAPI, VHR, SAPS, top-up, GAEC control

22. Control with Remote Sensing of area-based Subsidies in Hungary

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In the 2004 CwRS campaign, Hungary used VHR imagery for all control sites. The different image analysis steps are using the example of the IKONOS site HPS4 which is located approximately 80 km east of Budapest.

In Hungary, the basis of the current LPIS mainly consists of orthophotos from the year 2000. Although the majority of the block boundaries still follow the natural surface boundaries - which is an important criterion of the physical block system -, several changes since 2000 become visible.

Starting in 2004, VHR images also play a vital role in the remote sensing control of area based subsidies, providing the necessary accuracy for the area measurement. The CAPI process uses VHR images exclusively to determine the real cultivation structure, the result –the boundaries of the measured parcels– is also shown, in addition to the LPIS boundaries. The spatial and spectral properties of the imagery enable the proper parcel delimitation on an area containing numerous small parcels, like HPS4.

Keywords: Control with Remote Sensing, area-based subsidies, Hungary, IKONOS

23. Operational ortho processing of Eros imagery

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The Eros-A1 mission continues to enjoy considerable success as a non-US source of very-high-resolution satellite imagery. It has seen wide use in a range of arenas and is employed operationally in agriculture and security applications.

As a consequence of its unusual image acquisition process, the Eros image geometry is complex. However, the effects of this can successfully be modelled using rigorous photogrammetric techniques. Spacemetric uses such an approach to achieve sub-pixel accuracy (1.4 – 2.0 metres rms error) using only 10 to 15 ground control points (ref [1]).

Spacemetric provided the first commercial Eros production solution in 2001 to Metria, Sweden, as an upgrade to the previously supplied SIP Ortho production environment. This system also processes other high resolution satellites, such as Ikonos, QuickBird, Spot and Landsat, and is used in all image production for the Swedish control of area-based subsidies.

More recently, Spacemetric also cooperated with the National Aerospace Laboratory (NLR) in the Netherlands and with ImageSat International to provide an automated production solution for near real-time ortho processing of Eros and Spot imagery. This solution is currently in use by the Netherlands Armed Forces.

The Eros image geometry presents special challenges, but several years' experience of operational image production show that these can readily be accounted for using a rigorous photogrammetric approach. Sub-pixel image geometry can be achieved using Spacemetric's existing technology, including comprehensive tools for management of ground control and error budgets.

References

[1] Westin, T. & Forsgren, J., Orthorectification of Eros-A1 images, IEEE/ISPRS Joint Workshop On Remote Sensing And Data Fusion Over Urban Areas, Rome, Nov. 8-9, 2001

Keywords: Eros, orthorectification, accuracy

24. Effectively building Agri-Environmental applications with Giselle tool.

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The framework of our existing and future GIS products is Giselle, a web-based tool for managing and **editing** spatial GIS data. Giselle has built-in Open GIS conformity, data interoperability, OS and browser independency. The consistent compliance to those and other standards makes the tool highly flexible and adaptable.

With Giselle we managed in a short time to build very complex and powerful applications, like Map server with excellent printing capabilities, ELS for DEFRA, Land Use and LPIS for Slovenian Ministry of Agriculture, Forestry and Food.

Giselle applications provide viewing, editing and validating spatial data directly from within a Web browser. It's supported both fast and slow connection to the server side and even off-line work. Applications are highly optimized. Optimization was done on client and server side and also on data transfer. With simply adding new PC's to the cluster of application servers, it is possible to counterpart increased numbers of users and complexity of the requests. Very effective scalability and load balancing are built in every Giselle application.

Keywords: Land use, LPIS, GIS, OpenGIS, Interoperability, Load balancing

Extra requirements:
A) Internet connection. ADSL or higher is best, but also modem-like speed (33-56 kbit/s) is acceptable.
B) A panel for a poster behind the table for the demo computer

25. Control with remote sensing 2004 - VHR data (IKONOS and QuickBird): processing and comparison

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Ikonos Processing and Comparison;

1.) geometric correction
- RPC models in ERDAS Imagine 8.7
- parameters: 5 GCPs (4 corners + centre) plus linked points in overlapping areas, Cubic Convolution, DEMs (50m / 40m / 12.5m), resolutions 0.6m / 1m (PAN), 2.4m / 4m (XS), reference data: digital cadastral vector data (ALK) / visible points

2.) resolution merge
- principal components transformation with Cubic Convolution

3.) further steps of image processing
- 8-Bit conversions with Minimum-Maximum
- mosaicking with radiometric adaption

4.) comparison of VHR data (IKONOS and QB) and DOPs
- radiometric comparisons
- geometric comparisons

5.) difficulties in processing chain
- usable DEM / DEM-errors
- usable GCPs / check points, accuracy of GCPs / check points

Keywords: geometric correction, resolution merge, image processing, comparison of VHR data and DOPs

26. Using early season geometry to support farmers declarations - combining radar, internet en digital IACS application tools

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This research focuses on the possibilities to detect parcel geometry early in the growing season using ASAR images. Our aim is to support farmers' declarations with this 'early season geometry' and therefore increase the quality of declarations, processing and control. Our first results are very promising: Radar is indeed extremely useful especially early in the growing season to detect differences caused by land preparation activities. A first visual analysis indicates an even better crop parcel delineation with early season radar than with mid-season radar images.

A prototpe is developed for research and demonstration purposes. This prototype shows the ability of underlayers with early season geometry to support farmers in their declarations. This internet tool can also be used in other applications in the field of CAP data acquisition and control.

This research is made possible by NIVR, Alterra, Synoptics and the Ministry of Agriculture in the Netherlands.

Keywords: early season geometry; radar; IACS; LPIS; internet; GIS; farmer; prototype.

27. RapidEye the geo-information expert

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RapidEye, an information service provider, will supply customized geo-information products and services to the agricultural and cartography industry. RapidEye successfully completed financing July 2004 and is currently in the development and build phase of the satellite constellation and ground processing systems. Launch is planned in early 2007 with the begin of full scale operations mid 2007.

The RapidEye system will consist of a constellation of 5 satellites, the control centre, as well as the data processing and archiving facilities. The unique system will enable global monitoring of the earth's surface with daily revisit capabilities of any location on the globe and a total coverage of 4 Mkm^2 per day. The system will collect multi-spectral data in five frequency bands (blue, green, red, red-edge and NIR) with a ground sampling distance of 6.5m. Processing of image data and generation of customer products will be performed within one day after image reception.

Keywords: Satellite Constellation, RapidEye, multi-spectral scanner, geo-information products

28. Application of Remote Sensing and GIS technologies for Strengthening of the Agricultural Development in Bulgaria

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This poster presents the main project results related to the strengthening of the agricultural development using Remote Sensing and GIS technologies in Bulgaria. The FAO project TCP/BUL/8922 "Preparation of Land Cover Maps using Remote Sensing and GIS" was implemented in the period 1999-2001. It has produced 14 land cover maps at 1:50 000 scale for selected test areas, covering 5 600 km^2. These maps were prepared using Landsat TM/ETM, Ikonos and ERS data. The land cover classification was performed using the FAO Land Cover Classification System (LCCS).

To each mapped unit (polygon), soil type and erosion features were linked as attributes into the GIS system. This created a comprehensive database, which is unique in Bulgaria. The data collected in the database provide the possibility for different kinds of spatial analysis, which is necessary in land management.

For an area of particular interest, VHR data were used to produce an assessment of the state of vineyards, the updating of the linear features of a large scale topographical map and other applications.

In the frame of our FAO/GTOS activities Dynamic Maps Atlas is used for applications for land cover/land use in several municipalities for the purposes of decision makers. For the analysis of land cover the LCCS classification of the FAO/UN is used. The Atlas also contains the main layers of infrastructure, hydrology and the administrative borders of the municipality, as well as the analysis of the condition of the road network (incl. "agricultural" and temporary roads). The creation and analyses of the GIS layers is made on the base of satellite images from Landsat ETM and IKONOS.

For the purposes of precision farming a project in the area of designing vineyards has been developed. As an input information GIS layers for the type and structure of the soil, erosion characteristics, land cover/land use, proximity to water sources and irrigation channels, roads and villages, relief characteristics (precise DEM, slope and exposition), climate (temperature, rainfall, solar radiation) have been assembled.

Keywords: remote sensing, GIS, LCCS, land cover/land use, precision farming

29. Rocsat-2 for changes detection.

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Rocsat-2 is a new Earth Observation Satellite, owned by the NSPO (National Space Program Office) of Taiwan, built by Astrium (France) and launched May 20, 2004. Rocsat-2 is placed at an altitude of 890 km, on a circular, sun-synchronous and geo-synchronous orbit. Rocsat-2 proposes two resolutions, 2 meters in panchromatic mode and 8 meters in multi-spectral mode at Nadir. Swath is 24 kilometers. Rocsat-2 is circling on the same tracks every day (14 orbits per day) and can acquire every day any scene in its coverage.

These extracts are parts of the images taken over the port of Hao-Hsuing. Daily observations are facilitating changes detections. The same lighting conditions due to same viewing angle and same time are also facilitating and speeding up changes detection.

More details at http://www.spotimage.fr/html/_167_240_570_664_.php

Rocsat-2, every day another shot.

30. Rocsat-2, unique daily revisit capabilities

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This self explaining series over the port of Hao-Hsuing illustrates this unique capability.

This port is placed close to the track and the pixel size is 2 meters. For sites which are not close to the track, Rocsat-2's agility enables rapid pointing in the range of +/- 45° both along and across the track (forward, backward or side looking). In that case, the pixel size varies according to the viewing angle. As an indication, with an angle of +/- 30° from Nadir, the pixel size varies from 2 to 2.88 meters (5.17 m at 45°).

More details at http://www.spotimage.fr/html/_167_240_570_664_.php

Rocsat-2, every day another shot.

31. 10 years of CwRS conferences

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The Budapest conference is the tenth edition of the so-called CwRS conferences. It is an opportunity to check the evolution done since the first edition and also since the creation of the CwRS.

"Controls with Remote Sensing" were launched in 92 by DG AGRI. Satellite imagery proved quickly its deterrent effect to fight against fraud, which was crucial in the early years of the IACS implementation. The technology has been successfully transferred to and is presently operationally used by Member States.

Since 10 Years, CwRS methodologies have been dramatically improved to become a real and efficient on-the-spot check

The poster displays main facts such as: the progressive and sustainable development by all Member States, the permanent improvement of the CwRS methodology and of the use of satellite imagery available, and provides an overview of its importance (geographical, financial, quantity of images...) since 15 years.

Keywords: CwRS, History

32. Remote Sensing Controls 2004 in German Land Niedersachsen – control with VHR data IKONOS data in site HOLL

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IKONOS data in site HOLL;

6.) overview of the CwRS 2004 in Niedersachsen
- 3 sites, HOLL, BOCK DESP
- 2300 dossiers controlled
- B/W archive orthophotos together with actual HR satellite data

7.) site HOLL
- 920 dossiers controlled
- 70% coverage of the site with VHR-data
- IKONOS of 07th July 2004
- 30% of site with B/W archive orthophotos with 0.4 m resolution

8.) comparison of IKONOS VHR data and DOPs
- geometric comparisons
- comparisons natural colour – colour infrared

9.) options of four spectral bands
- alternatives for CAPI (natural colour or CIR)
- possibly reduced number of RFV due to better interpretation
- choice of two types of control documents (natural colour or CIR)

Keywords: geometric correction, resolution merge, image processing, comparison of VHR data and DOPs

33. VHR data collection, geometric processing and its classification with usage of with usage of teaching of class recognitions of neural networks.

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Monitoring of agricultural productivity area with remote sensing in relation to process of verification of LPIS data and farmers applications – evolves from initially applied low and medium resolution satellite data towards wider usage of VHR data. SCOR SA (Satellite Centre of Regional Operations) operates next multi source Earth Observation Ground Station, which started to be operational on September 24th 2004, as acting as public-private partnership of Government of Poland and one of leaders of IT in Poland – TECHMEX SA.

First image taken by new IKONOS Ground Station was received on September 30th for area of Stockholm, Sweden. First large area collection of IKONOS data over Poland allowed to collect 11 000 km² of IKONOS imagery during one pass of satellite.

TECHMEX and its dependant companies have participated in processing of 50 000 km² of IKONOS Precision Plus orthoimagery for territory of Poland in the frame of agreement with ARMA (Agency of Restructuring and Modernization of Agriculture), being the largest VHR orthophoto production project in Europe so far.

As number of IKONOS Ground stations in Europe grew recently to 3. Cooperation between IKONOS ground stations is an important factor related to increase of success of data collection. SCOR and European Space Imaging (EUSI) cooperated in an intensive way, sharing their satellite time in order to avoid competition during remote sensing campaign of 2004 year. Each Ground Station have passed their shapefiles to the other one in order to increase number of EI (equivalent images) to be collected during fixed and restricted satellite time of AWR (Acquisition Windows Requests) over Europe. Due to joint use of weather forecast of EU SI, of Polish Government and wider usage of Meteosat-8 satellite images – reprogramming of IKONOS satellite could take place even 30 minutes before given pass, taking into consideration last 15-minute weather data update. It allows to move IKONOS sensor into places free of clouds.

Activity of SCOR, TECHMEX and Baltic Centre of GIS was concentrated initially on research, testing and verification of geometric accuracy of VHR sources such as IKONOS and Quick Bird data. Quick Bird images were orthorectified and delivered to ARMA this year.

As there are more and more data from different VHR data users, it is well known that geometry of VHR imagery satisfies geometric requirements of European Commission, providing lot of examples that it is possible to achieve even sub-pixel geometric accuracy, while using of good quality DEMs and well measured GCPs. (with planimmetric accuracy better than of 20 cm).

At the same time there is still not to much examples of classification of VHR imagery (of IKONOS and Quick Bird data) with usage of teaching of class recognitions of neural networks. First results of VHR imagery classification with COTS application are showed and compared to other results of classification of IKONOS and Quick Bird images for urban-rural intermediary zones of

Gdansk and Wroclaw, which promise to automate VHR imagery classification for the larger areas of Poland. Since archive of IKONOS imagery grew rapidly for area of Poland a concept of updating of aerial orthophoto with VHR data emerges, for the whole territory of Poland, together with application of detection change and object classification methods.

Fig.1. one of samples of classification on top of PSM IKONOS orthoimagery for area in south-eastern Poland

Poster will show:

- collection cabability of IKONOS ground station for Poland
- examples of results of joint EU SI & SCOR IKONOS data collection,
- existing archive of IKONOS for Poland (124 403 km^2)
- comparative examples of Landsat, IRS and IKONOS data classification

Software demonstrations (abstracts)

1. Software demo: WEB based applications for CAP farmer declaration controls and managing in Italy

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In Italy all the software applications enabling both collection and control of CAP farmer declarations are accessible, for authorized users, through the WEB site S.I.A.N. (Sistema Informativo Agricolo Nazionale- National Agricultural Informative System): http://www.sian.it.

In the present session the main software applications for this purpose will be presented, as follows:

- WEB Access mode and registering at the S.I.A.N. portal, through services provided by the Servizio Gestione Utenti (user access management);
- Decision Support System (DSS) for declaration collection and completed controls monitoring
- Presentation mode of subsidy claim via WEB for 2004;
- Farmer dossier access and visualization, to control overall farm parcels and livestock presence for all the Italian CAP farms (alpha-numeric and GIS data) up to received payments;
- GIS Software for satellite imagery interpretation VHR+HR and ortho-photos, overlaid with cadastral maps, working on line through the centralized GIS data base of AGEA (Agency for payments in agriculture). Crop detection and declaration data comparison for the selected sample of farms,

Keywords: on line declaration collection, WEB, national GIS, VHR

2. Effectively building Agri-Environmental applications with Giselle tool.

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The framework of our existing and future GIS products is Giselle, a web-based tool for managing and **editing** spatial GIS data. Giselle has built-in Open GIS conformity, data interoperability, OS and browser independency. The consistent compliance to those and other standards makes the tool highly flexible and adaptable.

With Giselle we managed in a short time to build very complex and powerful applications, like Map server with excellent printing capabilities, ELS for DEFRA, Land Use and LPIS for Slovenian Ministry of Agriculture, Forestry and Food.

Giselle applications provide viewing, editing and validating spatial data directly from within a Web browser. It's supported both fast and slow connection to the server side and even off-line work. Applications are highly optimized. Optimization was done on client and server side and also on data transfer. With simply adding new PC's to the cluster of application servers, it is possible to counterpart increased numbers of users and complexity of the requests. Very effective scalability and load balancing are built in every Giselle application.

Keywords: Land use, LPIS, GIS, OpenGIS, Interoperability, Load balancing

Extra requirements:
A) Internet connection. ADSL or higher is best, but also modem-like speed (33-56 kbit/s) is acceptable.
B) A panel for a poster behind the table for the demo computer

3. Advanced Geodata Technology with PromptServer

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The Product:

PromptServer is the comprehensive solution for geo-referenced imagery. Designed to handle thousands of images simultaneously, now and in the future, PromptServer solves the problems related to geo-imagery by redefining the methods of management, processing and distribution of such imagery. PromptServer® is a system-independent client-server application designed for fast access to huge and complex image datasets which are stored in their primary form and instantly summoned and displayed on-the-fly. Depending on the content of its image catalogue, which contains terabytes of data, PromptServer is able to display instantly hundreds of images regardless of size, volume, format or compression. Users can pan and zoom to any part of the image quickly and without delay in various GIS, CAD and Internet/Intranet environments.

PromptServer comes as a solution with an impressive list of features to handle ortho, satellite, topographic or other imagery. The system supports major industry CAD and GIS applications.

Prompt GmbH is headquartered in Munich, Germany, and supported by an international network of regional offices and resellers. As a member of the MAPS Group of Companies, Prompt can rely on 30 years of experience in geographic and spatial data acquisition, processing and integration.

Keywords: Image Processing Server, Image Data Management, On-the-fly Processing, Image Datasets

4. ImageServer, An Application for Archiving CwRS Imagery

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The MARS PAC ImageServer is an online archive for satellite images out of CwRS campaigns hosted at JRC. It offers the possibility to search for images via attribute (acquisition year, satellite type, etc) and spatial filters via a web interface. The images found can be directly visualized on-screen and loaded via various protocols into GIS or image processing software and also into office applications. The raw images can be downloaded for further processing and analysis. The system is set up as a framework of disk storage, map server, spatial database and image web server and offers access to currently about 6000 satellite images.

The VHR Browser will be set up as a system for browsing and viewing the VHR quicklooks. It allows image providers to upload quicklooks of their image acquisitions and enables the national contractors to immediately browse and visualize the provided quicklooks. This way the system intends to substitute the current email distribution system of VHR quicklooks.

Keywords: online archive, image server, image metadata, WebGIS, VHR, quicklooks

5. AGROffice - an integrated farm to fork solution

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Documentation is the base knowledge that one has to have when he wants to trace back to farms according the EU "farm to fork" slogans and legislations. Food sales channels and food industry are doing it only partly today, the agro wholesale is sporadic and most of the farmers are not yet involved.

Documentation is only one element of an integrated solution on the fields. With PROGIS AGROffice technology many activities on the farm will be measured or done as there are:

- Documentation (§§§ according General Food Law),
- EU subsidy claim calculation (orthoimage and GIS based technologies are a must from 1.1.2005 according §§§)
- Fertilizer balancing (from 1.1.2005 expected §§§, in several EU countries already local legislation),
- Field profit margin calculation (the farmer has to do it in any case if he wants to survive),
- transfer infos for tracing to customers (§§§ 1.1.2005)
- Logistics for cultivation, caretaking, harvesting,
- Precision or smart farming with all their positive business AND ecological aspects,
- Virtual farming to overcome the European farm structure,
- Environmental planing and rural area planing in cooperation with other organisations, the farmer as eco- consultant,
- Or others like forestry, (water/wastewater..) -pipelines, smart communities, sensor integration (meteorology, water, soil) and last but not least everywhere Geographical information based on orthoimages/vector data for any thematic map with GPS/dGPS (future GALILEO) integration etc.

Keywords: Traceability, Documentation, Planing, EU-Subsidies

6. iSMART, building IACS in an open standards IT environment

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iSMART® is a suite of Enterprise Spatial Application software products from eSpatial, providing a deployment platform and rapid development environment for integrated geospatial applications such as IACS in standard Enterprise IT environments, including Oracle Spatial.

iSMART has been used to build the recently deployed Greek land parcel data capture system (GRMap) as well as the Irish IACS application (iMap).

Rather than providing spatial capability through a proprietary GIS environment within a monolithic application using proprietary data stores, iSMART offers a significant new approach to developing and deploying IACS spatial applications.

iSMART implements all spatial functions in a standard enterprise environment with all data stored in an Oracle database (including Oracle Spatial). Services are provided in a standard enterprise Java (J2EE) application server with support for the full range of clients. The architecture allows powerful spatial functionality to be deployed directly from the server, to any client and any application, anywhere.

iSMART is completely based on open-standards and so it is easily integrated with third party applications. It directly leverages the full range of Enterprise Qualities of Service provided by Enterprise Java (J2EE) application servers and by Oracle such as:

- Scalability • Industry standard Security; • Reliability;
- Transactional integrity; • Performance; • Availability.

The iSMART approach greatly reduces the effort, specialist skills, and risk of spatially enabling applications, while significantly enhancing the capabilities, depth of integration, scalability, performance and reliability of such applications.

Keywords: LPIS, IACS, Data Capture, iSMART, Oracle

7. Control of Area Based Subsidies in Hungary in 2004

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Since 2000, the Institute of Geodesy, Cartography and Remote Sensing (FÖMI) has carried out a program for the control of area based subsidies with remote sensing, to the Ministry of Agriculture and Rural Development (MARD) in Hungary. Since 2004, FÖMI - via its Remote Sensing Centre (FÖMI RSC) - carries out the CwRS program as a delegated duty, under the MARD-ARDA-FÖMI delegation contract. The CwRS program covered 9 counties in 2000 and 2001, since 2002 it covers whole Hungary.

In 2004 the subsidies have been controlled under EU regulations (different crop groups for SAPS and top-ups, special controls for the Good Agricultural and Environmental Conditions). In 2004 the total number of dossiers was around 208 000 in Hungary, the number of dossiers controlled with remote sensing is more than 8600. Due to the large number of claims 80 % of the control sample have been checked by remote sensing. There were 9 sites, all covered by VHR data (5 with IKONOS, 4 with QuickBird images). Six sites' VHR data have been financed by the European Commission (DG AGRI). The total area controlled was approximately 200 000 hectares, with 15 000 physical blocks. There were around 40 000 agricultural parcels to control, on average 4,6 parcels/farmer and 23,1 hectare/claim. Three conditions for the Good Agricultural and Environmental Conditions (GAEC) have also been controlled by remote sensing. The results of control have been submitted to the Agricultural and Rural Development Agency (ARDA) in regular reports.

The CAPI software for interpretation was developed by FÖMI, and it has been adjusted to the annual conditions of the regulations of subsidy schemes. More than 1 million individual block mapsheets have been delivered for the farmers (as an annex for the application), where they were expected to indicate the agricultural parcels they cultivate. Their drawings of parcel boundaries have been digitized and controlled by CAPI and stored in GIS. Statistics will be presented in detail on the poster.

Keywords: CAPI, VHR, SAPS, top-up, GAEC control